FIVE-YEAR REVIEW REPORT FOR TIBBETTS ROAD SUPERFUND SITE STRAFFORD COUNTY, NEW HAMPSHIRE

Prepared by

U.S. Environmental Protection Agency
Region I
BOSTON, MASSACHUSETTS

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8/20/13
Date

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LIST OF ABBREVIATIONS

ARCADIS	ARCADIS, formerly known as Gegarty & Miller, is the contractor working for Ford Motor Company
AROD	Amended Record of Decision
BTEX	The major components of gasoline, Benzene, Toluene, Ethylbenzene, and Xylene.
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
Ford	Ford Motor Company, the Potentially Responsible Party for the site.
FS	Feasibility Study
IC	Institutional Control on groundwater use
ICL	Interim Cleanup Level
ISCO	*In-situ* chemical oxidation
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MIBK	Methyl isobutyl ketone
NCP	National Contingency Plan
NHDES	New Hampshire Department of Environmental Services
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCBs	Polychlorinated biphenyls
PCE	Tetrachloroethylene
PRP	Potentially Responsible Party
ppb or µg/L or µg/kg	Parts per billion or micrograms per liter (or kilogram)
ppm or mg/L or mg/kg	Parts per million or milligrams per liter (or kilogram)
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SLVWD or Water District	Swains Lake Village Water District

SDWA	Safe Drinking Water Act
SVOC	Semi-Volatile Organic Compound
TCE	Trichloroethylene
VER	Vacuum Enhanced Recovery
VOC	Volatile Organic Compound
1992 ROD	1992 Record of Decision
1995 CD	1995 Consent Decree
1998 AROD	1998 Amended Record of Decision

EXECUTIVE SUMMARY

The remedy for the Tibbetts Road Superfund Site (the "Site") in Barrington, New Hampshire, as outlined by decision documents in 1992 and 1998,[1,2] and governed by the 1995 Consent Decree,[3] has included the following:

1. Installed a public water treatment plant to supply drinking and domestic water to residents whose wells were, or may become, contaminated.
2. Established Institutional Controls (ICs) to prevent the consumption or contact with contaminated groundwater.
3. Removed contaminated soil from the Site for disposal. Incinerated 3.5 cubic yards of dioxin contaminated soil. The treated soil was disposed off-site.
4. Removed over 800 pounds of volatile organic contaminants (VOCs) from the overburden aquifer through dual-phase vacuum extraction.
5. Removed VOCs and inorganic contaminants from the bedrock groundwater through pumping and treating.
6. Implemented a phytoremediation remedy to augment natural attenuation in the overburden aquifer.

The triggering action date for this Five-Year Review is August 28, 2008, the date of the last Five-Year Review. During this Five-Year Review EPA made the following findings:

1. The potentially responsible parties constructed the remedy in accordance with the requirements of the 1992 Record of Decision and the 1998 Amended Record of Decision.
2. The construction and operation of a drinking water treatment plant and water supply network provides treated drinking water to the public inside the area of Institutional Controls (ICs).
3. Groundwater withdrawals just outside the area of ICs induced contaminants to migrate to private wells. The affected wells have been provided with point-of-use treatment systems. Monitoring assures that no other groundwater users outside the area of ICs are affected. No exposure to Site contaminants through drinking water is occurring.
4. Drum and soil removal actions, a vacuum extraction remedy, and phytoremediation coupled with bioremediation, reduced contamination to below ICLs in much of the overburden aquifer. Monitoring and modeling have demonstrated no risk to residents from vapor intrusion.[4]
5. A groundwater pump-and-treat remedy followed by *in-situ* oxidation in the bedrock aquifer reduced contamination, but contamination above the ICLs remains.
6. Institutional controls were effective and operating as intended. However, due to the high transmissivity associated with the bedrock fractures, Site contaminants can be induced to migrate and contaminate new, private drinking water wells outside the present limit of ICs.
7. Based on interviews with Town officials and meetings with the public, no one believes that the Site poses an immediate threat.

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[1] *Record of Decision, Tibbetts Road Superfund Site*, September 29, 1992 (U.S. Environmental Protection Agency: Region 1, Boston) p. 44 -58.

[2] *Amended Record of Decision, Tibbetts Road Superfund Site*, September 28, 1998 (U.S. Environmental Protection Agency: Region 1, Boston) p. 23 - 29.

[3] *Consent Decree, United States of America and State of New Hampshire, Plaintiffs v. Ford Motor Company, Defendant*. Civil Action C-91-120-S, C-91-194-S, Lodged 11/8/1994 and entered 3/20/1995.

[4] *Vapor Intrusion Evaluation, Tibbetts Road Site, Barrington, New Hampshire.* ARCADIS, Chelmsford, MA, February 28, 2012.

The remedial actions taken are protective of human health and the environment in the short-term because there are no completed exposure pathways. However, to be protective in the long-term, a number of follow-up actions are necessary: extend the current drinking water system to an existing residential subdivision impacted by bedrock groundwater contaminants, install additional bedrock monitoring wells and perform hydrologic analysis as directed by the approved work plan to determine the limit of influence on the Site bedrock groundwater contaminants, expand institutional controls through a municipal ordinance to include areas that may influence the migration of contaminants in bedrock groundwater, evaluate additional measures to reduce bedrock groundwater concentrations and implement those that are successful, and remove soils in an area of overburden groundwater contamination.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Tibbetts Road		
EPA ID: NHD989090469		
Region: 1	**State:** NH	**City/County:** Barrington / Stafford
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Darryl Luce		
Author affiliation: US Environmental Protection Agency		
Review period: 2/20/2013 – 8/28/2013		
Date of site inspection: 2/20/2013		
Type of review: Policy		
Review number: 3		
Triggering action date: 8/28/2013		
Due date *(five years after triggering action date)*: 8/28/2013		

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Changed Site Conditions			
	Issue: Contaminated bedrock groundwater has migrated to the Cedar Creek subdivision. Continued use of groundwater will induce further migration and potentially contaminate additional drinking water wells.			
	Recommendation: Abandon all drinking water wells on Cedar Creek and provide water through an alternative means.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	March 2015

OU(s): 1	Issue Category: Monitoring			
	Issue: High concentrations of contaminants in bedrock fractures may migrate further outside the limits of the institutional controls. Determine the limit of potential migration.			
	Recommendation: Perform additional monitoring, geochemical and hydrologic work to determine the bedrock aquifer properties.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	January 2015

OU(s): 1	Issue Category: Institutional Controls			
	Issue: Because of highly transmissive bedrock fractures, new groundwater users outside the current limits of the Institutional Controls may induce migration of bedrock groundwater contamination.			
	Recommendation: Expand the area of Institutional Controls to those areas identified that may cause the migration of contaminants or adversely affect the remedial action.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	July 2015

Issues/Recommendations (continued)

OU(s): 1	Issue Category: Remedy Performance			
	Issue: Bedrock groundwater high concentrations of contaminants			
	Recommendation: Evaluate additional measures to reduce bedrock groundwater concentrations. Perform and evaluate directed groundwater recirculation using persulfate oxidizing compound as a treatability study			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	Spring 2015

OU(s): 1	Issue Category: Remedy Performance			
	Issue: Overburden groundwater in one well remains contaminated with toluene above ICLs.			
	Recommendation: Remove contaminated soil in area surrounding well and continue monitoring to assess effectiveness of removal.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA/State	Spring 2015

Site - wide Protectiveness Statement

Protectiveness Determination:
Short-term Protective

Protectiveness Statement:
The remedial actions taken are protective of human health and the environment in the short-term because there are no completed exposure pathways. However, to be protective in the long-term, a number of follow-up actions are necessary: extend the current drinking water system to an existing residential subdivision impacted by bedrock groundwater contaminants, install additional bedrock monitoring wells and perform hydrologic analysis as directed by the approved work plan to determine the limit of influence on the Site bedrock groundwater contaminants, expand institutional controls through a municipal ordinance to include areas that may influence the migration of contaminants in bedrock groundwater, evaluate additional measures to reduce bedrock groundwater concentrations and implement those that are successful, and remove soils in an area of overburden groundwater contamination.

Five-Year Review Report

I. Introduction

The purpose of a Five-Year Review is to determine whether a remedy at a Superfund site is protective of human health and the environment. The methods, findings, and conclusions of a review are documented in a Five-Year Review report. In addition, Five-Year Review reports identify issues, if any, and recommend action(s) necessary to address them.

The U.S. Environmental Protection Agency (EPA), Region I prepared this Five-Year Review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c) as amended states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The EPA Region I conducted this Five-Year Review of the remedial actions implemented at the Tibbetts Road Superfund Site (the "Site") in Barrington, Strafford County, New Hampshire (Figures 1 and 2). This review was conducted for the entire Site from February 2013 through July 2013. This report documents the results of the review.

This is the third Five-Year Review Report for the Tibbetts Road Site. The triggering action for this policy review is the completion date of the second Five-year Review in August 2008. This Five-Year Review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. Specifically, following implementation and operation of the groundwater remedy, groundwater remains contaminated above cleanup levels.

Figure 1: Site Location Map.

The topographic map shows the location of the Site relative to the State and surrounding features. The datum is from 1981 and ARCADIS altered the base of this document to supply the locus map and the scale information. The Site is located at 43º 10' 46" N and 71º 02' 01" W. The black lines superimposed on the topographic map are spaced at 1 kilometer intervals.

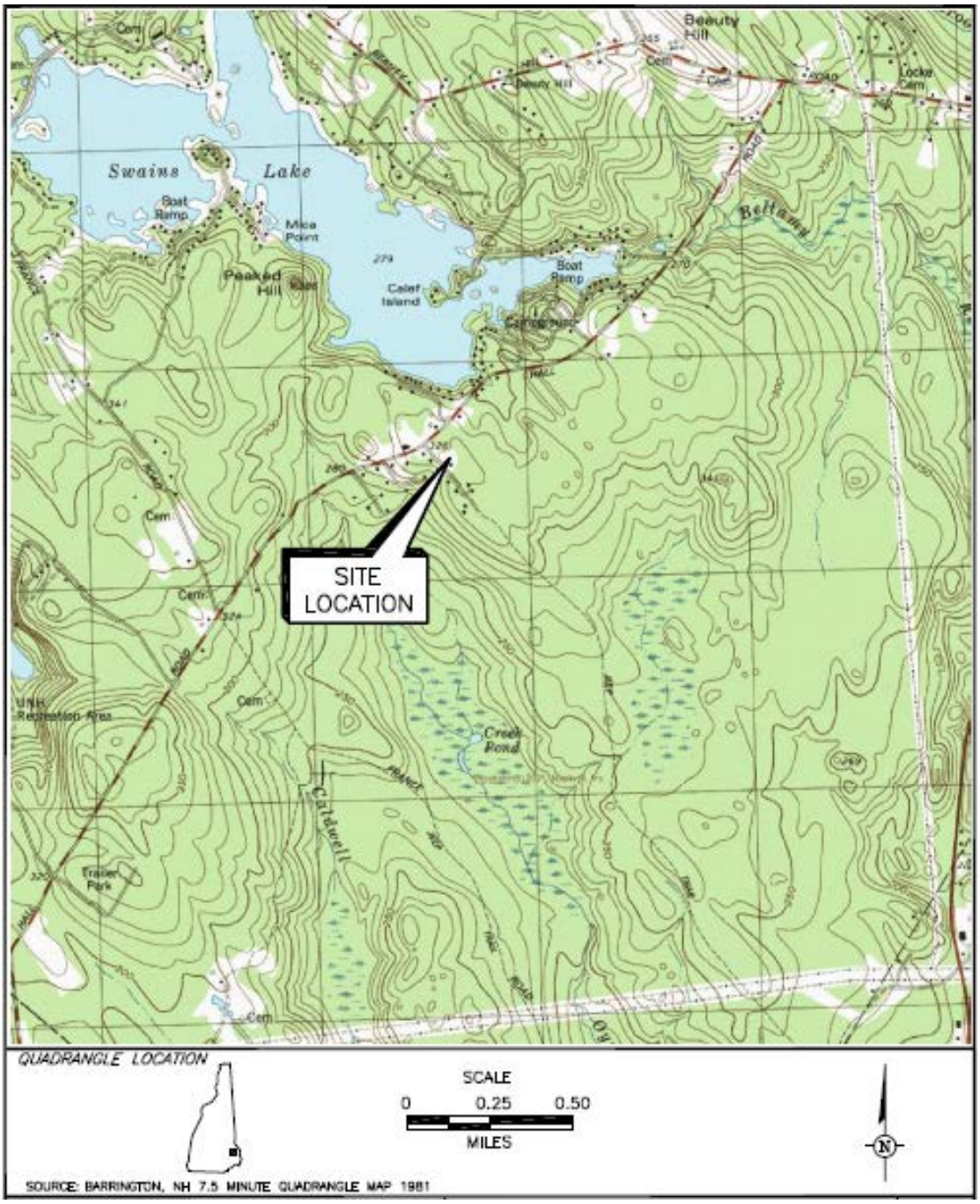
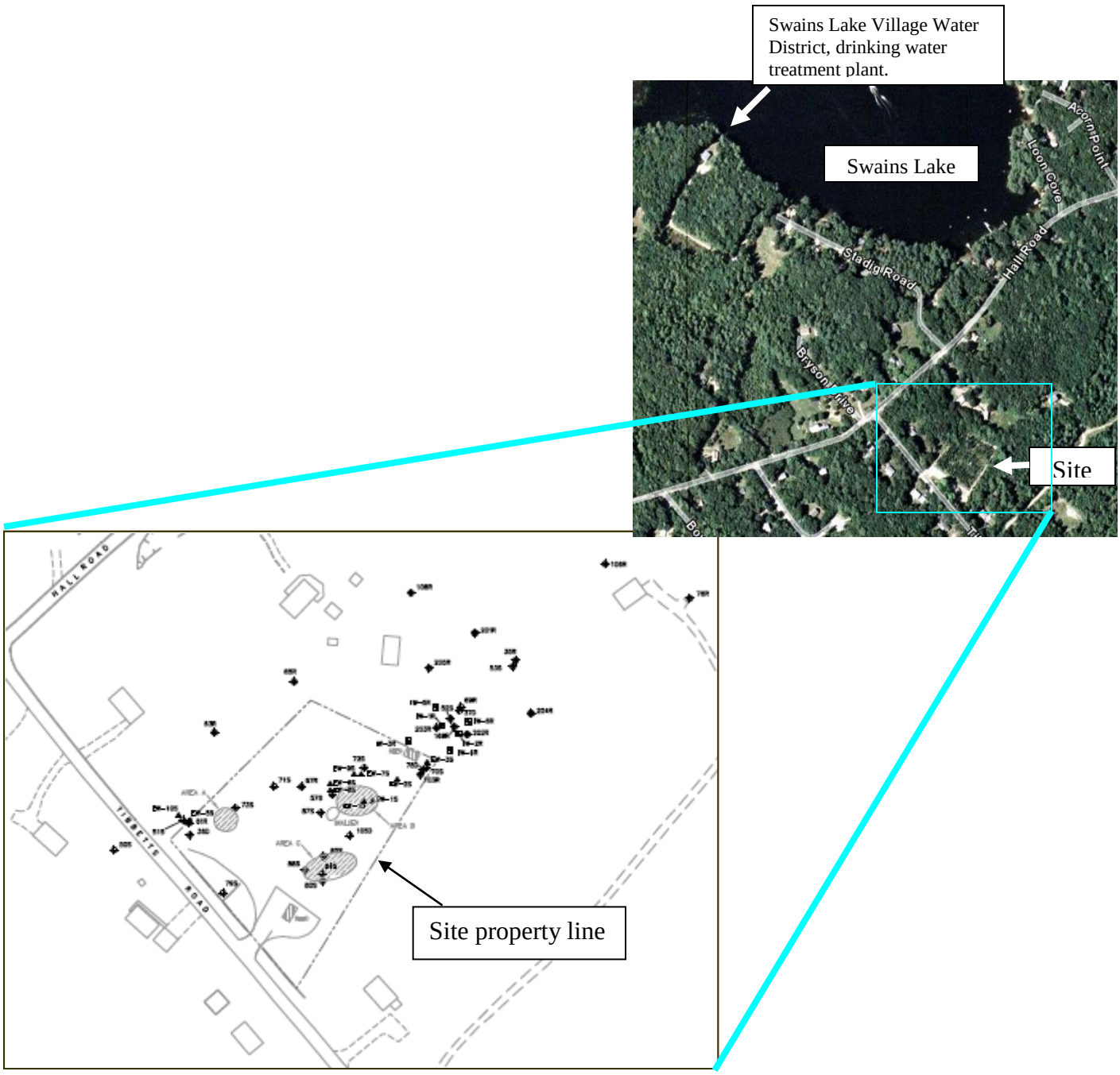


Figure 2: Site Features.
The aerial photograph from GoogleEarth Pro, on the upper right, shows the Site and neighborhood as they appeared in 2006, and is virtually unchanged since that time. Various features are identified including the location of Swains Lake, the drinking water treatment plant and the road network. In the aerial, the property boundaries of the Site are evident by the change in vegetation. The line drawing to the lower left, prepared by ARCADIS, shows the Site in greater detail, the property line (enclosing 1.9 acres), the location of the nearby homes, a portion of the monitoring well network, and the location of the former drum storage areas (shaded). There are no surface water bodies on the Site.



II. Site Chronology

Table 1 below summarizes the chronology of the events at the Site. More detailed chronologies are available in the Remedial Investigation/Feasibility Study (RI/FS) as well as the 1992 Record of Decision (1992 ROD) and the 1998 Amended Record of Decision (1998 AROD).

Table 1: Chronology of Site Events

Date	Event
1945 to 1958	The Site serves as the residence of Alexander Johnson and his family. During this period, Mr. Johnson transports drums containing industrial solvents and paint by-products to his home for storage and use.
1982	Acting on complaints from nearby residents, State of New Hampshire officials discover more than 300 drums at Mr. Johnson's residence and evidence of releases to the environment. Subsequent inspections find that the contents of many of the drums were discharged onto the ground or were used to burn cars prior to cutting-up for scrap. These discharges and uses resulted in the contamination of soil with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenols (PCBs), and dioxin. Some of these compounds migrated to groundwater resulting in groundwater contamination with VOCs, acetone, and gasoline components including benzene, toluene, ethylbenzene and xylene (BTEX). Arsenic and manganese are also present in groundwater at concentrations that exceed levels protective of human health and the environment.
1984	The State of New Hampshire requests EPA's assistance in removing drums and contaminated soils at the Site. EPA removes 337 drums containing solvents, PCBs, and other hazardous materials. EPA also identifies risk due to contaminated groundwater found in nearby residential drinking water wells.
1984 to 1985	The State of New Hampshire and EPA conduct investigations into the extent of soil and groundwater contamination.
1986	EPA and the State excavate and remove over 405 cubic yards of soil contaminated by solvents and PCBs from the Site. EPA incinerates four cubic yards of soil contaminated with dioxin at the Site. The Site is finalized for inclusion on the National Priorities List (NPL) on June 10, 1986.
1987 to 1988	EPA and the State construct a drinking water treatment plant and water distribution network to serve approximately 45 homes whose wells are contaminated or threatened by groundwater contamination from the Site. Drinking water is supplied using treated water from nearby Swains Lake. A group of residents surrounding the Site form the Swains Lake Village Water District to assume responsibility for the operation and maintenance of the water supply system.

Table 1: Chronology of Site Events

Date	Event
1992	EPA holds a public informational meeting on June 24, 1992 to discuss the results of the Remedial Investigation and Feasibility Study (RI/FS) and to present the EPA's proposed cleanup plan for the Site. After soliciting comments from the public, the cleanup plan for the Site is finalized in the Record of Decision signed by EPA on September 29, 1992.
1993	EPA extends the distribution of the Swains Lake Village Water District supply system to include several nearby residences and a seasonal campground.
1994 to 1995	EPA, the State, and the Swains Lake Village Water District negotiate a Consent Decree with Ford Motor Company (Ford), the Potentially Responsible Party (PRP). Ford agrees to help improve and fund the drinking water supply system operated by the Swains Lake Village Water District and to conduct the remedial action at the Site.
1995	Ford's consultant, ARCADIS, begins the supervised remedial action at the site. The original Johnson residence, damaged by fire and more than ten-years of abandonment, is demolished. ARCADIS clears the Site, grades and paves approximately 2 acres overlying contaminated groundwater, and begins operation of a vacuum-enhanced groundwater recovery (VER) system.
1995 to 1997	ARCADIS operates the VER system in the overburden aquifer over the entire Site. The VER system removes more than 800 pounds of VOC contaminants over the 3 years of operation.
1998	After attaining the remediation goals established in the 1992 Record of Decision, the VER system is shut down and the asphalt cap over much of the Site is removed. The remedy is described in the ROD as amended on September 28, 1998, to reflect that groundwater treatment will consist of bioremediation and phytoremediation with some potential "hot-spot" remediation using the existing VER system. Approximately 1,600 hybrid poplar trees were planted at the Site in May of 1998 as part of the phytoremediation component of the Amended ROD. The Preliminary Close-Out Report is signed by the EPA on September 29, 1998, signifying the completion of the construction activities at the Site.
1998 to present	Groundwater monitoring shows concentrations of Site contaminants remain above cleanup levels in a limited area of the overburden aquifer and the bedrock aquifer. Concentrations of contaminants in the bedrock groundwater north of the Site remain high.
2003	First Five-Year Review is issued by the EPA.
2003 to present	ARCADIS maintains equipment on the Site to perform hotspot remediation in the bedrock aquifer, near the northern property line, on a periodic basis.
2003 to 2006	ARCADIS performs a series of sodium permanganate injections into the bedrock aquifer near the northern property line.

Table 1: Chronology of Site Events

Date	Event
August 28, 2008	EPA issued the second Five-Year Review.
2008 through the present	Construction of new homes on Sera Lane (now Cedar Creek) begins on the southern edge, outside of the limit of institutional controls.
Summer 2011 through March 2013	ARCADIS evaluates deep bedrock groundwater throughout the area. In December 2011 bedrock drinking water wells in the Cedar Creek subdivision immediately adjacent to, but outside the limit of institutional controls were discovered to be contaminated with low concentrations of Site contaminants. As of June 2013 a total of five drinking water wells had Site contaminants. All wells above drinking water standards have in-home treatment systems to provide clean drinking water.
February 28, 2012	Vapor intrusion assessment finds no potential for exposure of residents to Site contaminants through indoor air.
July 2012	Swains Lake Village Water District drinking water treatment plant converts from surface water supply in Swains Lake to two bedrock wells.
February 20, 2013	Public Meeting to discuss Site-related and Five Year Review issues.

III. Background

The Tibbetts Road Superfund Site (the "Site") is located in the Town of Barrington, Strafford County, southeastern New Hampshire, 43º 10' 46" N and 71º 02' 01" W. The 1.9-acre Site is owned by the estate of Alexander Johnson, and is bordered by Tibbetts Road to the southwest, and by residences on the remaining three sides. See Figure 2.

A. Physical Characteristics

Physical Setting

The Site is in an area of light, rural residential development. The area was formerly logged and farmed for a number of years prior to residential development that began in the late 1970's. Except for the landscaped pockets surrounding each residence, the area consists of oak-maple-white pine forest. At the southern end of Tibbetts Road is the entry to the 1,435-acre Samuel A. Tamposi Water Supply Reserve Conservation Land (the "Tamposi Property"). This property is protected from future development by a conservation easement held by the Society for the Protection of New Hampshire Forests.[5,6] The Tamposi property consists of wetlands and mixed hardwood and conifer forest and is set aside for passive recreation and watershed protection. Swains Lake lies 800 feet north of the Site.

[5] Fosters Daily Democrat, Wednesday, January 18, 2012.
[6] http://barringtonconcom.org/6. Samuel A. Tamposi Water Supply Reserve %28SATWaSR%29 Main Page.html , accessed on May 1, 2013.

Site Conditions

Currently, the 1.9 acre Johnson property exists as a vacant lot and has a driveway, a small garage, a large sugar maple at the front of the lot, and a large number of poplar trees. The poplar trees are part of the phytoremediation remedy completed in 1998. ARCADIS maintains the property, including caring for the grounds. Photos of the Site and surrounding neighborhood are attached in Appendix C.

Surrounding Properties, Condition and Use

The area surrounding the Site is zoned for residential use although one home at the end of Tibbetts Road has an attached auto paint shop. During the period of Site characterization and active remediation no new homes were built within ½ mile of the Site. After 2008 a residential open space subdivision, Cedar Creek (formerly Sera Lane), consisting of 18 single-family homes, began construction at the end of Tibbetts Road, 600 feet south of the Site. As of June 2013, sixteen of the 18 homes have been built.

Surface Water Hydrology

The Site straddles a ridge that runs northwest towards Swains Lake. The ridge serves as a drainage divide between the Oyster River to the south and the Bellamy River to the north. Most of the Site lies in the Bellamy River portion watershed. Approximately ½ of the Site, the southern portion along Tibbetts Road, lies in the Oyster River watershed. Surface water runoff from the Site is via overland flow. Figure 1 displays the terrain and water features surrounding the Site. The primary water bodies include Swains Lake 800 feet to the north and an extensive wetland to the south. However, there is a small wetland that is not shown on Figure 1 that lies approximately 600 feet north of the Site and drains westward to Swain's Lake. Swains Lake is the result of an impoundment and overall is a very shallow lake despite its large lateral extent.

Geology

Overburden geology at the Site consists of a 15 to 25 feet thick layer of mixed sands and gravels, glacial till. The glacial till rests on top of a lens of compacted clay known as a "lodgment till" that is more than 30 feet thick and acts as an aquiclude. The lodgment till pinches out just beyond the northern and southern property bounds of the Site. The lodgment till is underlain by a fractured granite bedrock. This bedrock is more precisely described as a quartz-monzonite (5 to 20% quartz and 35 to 65% alkali and plagioclase feldspar).[7] The bedrock fractures consist of many sub-horizontal release fractures in the upper, weathered sections that connect to steeply dipping fractures that are oriented roughly northeast-southwest and northwest-southeast.[8] Figure 3 has a cross-section that shows the geology beneath the Site in schematic form.

[7] *Remedial Investigation Report Tibbetts Road Superfund Site, Volume I*, June 1992 (CDM Federal Programs Corporation, Boston, MA) p. 3-1 to 3-2.
[8] *Remedial Investigation, Volume I*, p. 3-7 to 3-11.

Hydrogeology

Groundwater flow at the Site occurs in both the overburden and bedrock aquifers. Infiltrating surface water on the Site enters the overburden aquifer. The overburden aquifer groundwater flow mirrors the surface topography, resulting in both a northward and southward flow of groundwater described above in surface water hydrology. The overburden groundwater flows laterally to the edge of the lodgment till and then downward into the weathered bedrock.[9]

Groundwater then enters the weathered bedrock via the sub-horizontal release fractures before being intercepted by the steeply dipping fractures that connect to the regional fracture system. Generally, bedrock groundwater flow from the area north of the Site, where contaminants enter the bedrock aquifer, is in a radial pattern primarily controlled by fractures oriented northeast-southwest with minor orthogonal fracture sets. The fracture flow extends over considerable distances and can be significant in volume.[10] During pump tests the yield in well 76R was estimated to be 400 gallons per minute. Domestic wells typically found productive fractures 300 feet below ground surface and yielded 20 to 70 gallons per minute. Overall though, fracture flow is unpredictable, many bedrock wells in Cedar Creek do not yield high volumes, perhaps due to the steep dip of the main fractures. Figure 3 also generalizes the groundwater flow at the Site.

B. Resource Use

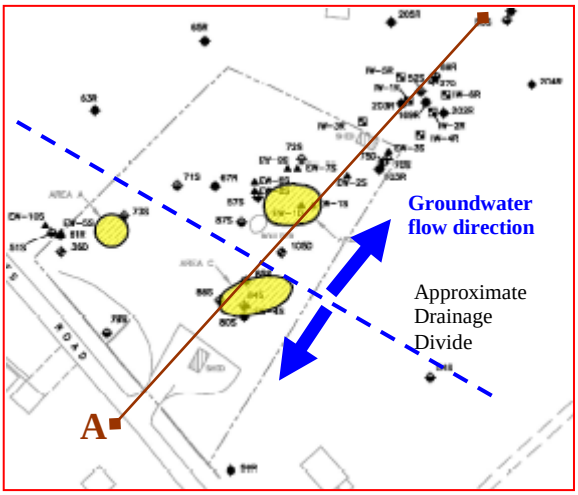
Groundwater and surface water constitute important resources to the surrounding community. With the exception of the area surrounding the Site, drinking water is supplied only by private wells in bedrock aquifers. Water supply to the area surrounding the Site is described in subsection D, Drinking Water Treatment Plant and Distribution System.

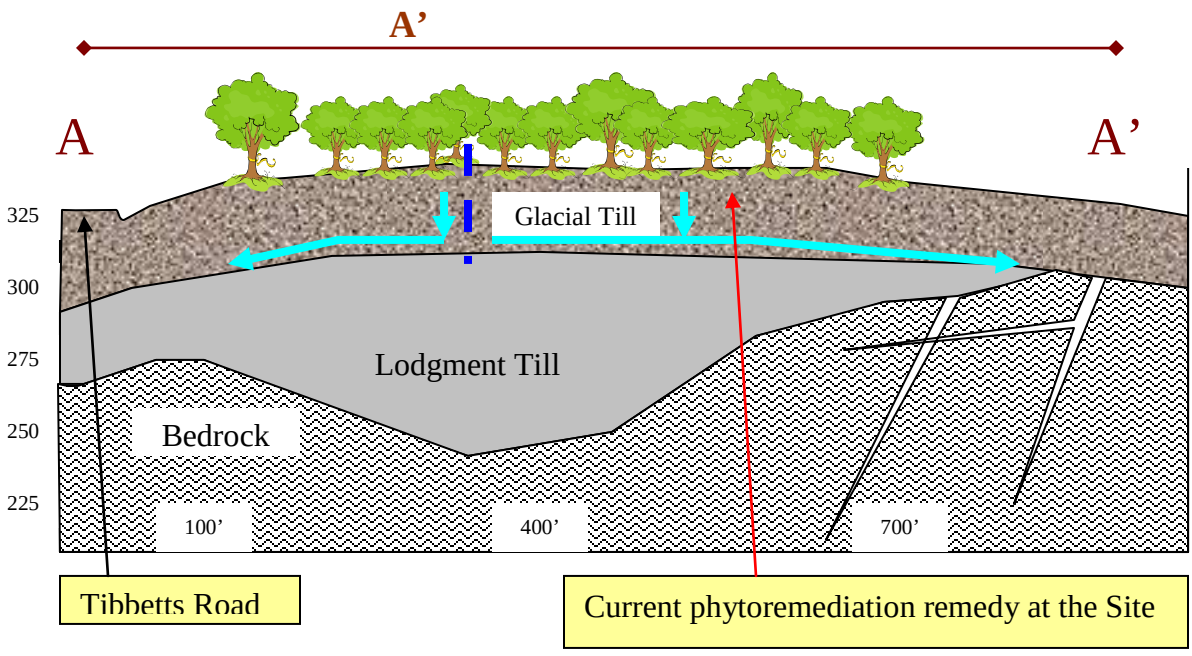
The many lakes, ponds and streams in the area are also important recreational resources in Barrington. Swains Lake is classified as a class "B" waterway by the State of New Hampshire and is used for recreational swimming, boating and fishing. A seasonal campground, approximately 1 kilometer north of the Site, lies on the eastern shore of Swains Lake. Swains Lake is ringed by many large homes that were converted from seasonal cottages. Swains Lake is also a tributary to the Bellamy River which eventually forms the Bellamy Reservoir, a primary drinking water resource for the city of Portsmouth, New Hampshire.

[9] *Remedial Investigation, Volume I*, p. 3-5 to 3-6.
[10] *Remedial Investigation, Volume I*, p. 3-10 to 3-23.

Figure 3: Site Geology and Groundwater Flow

Site geology consists of three primary units depicted in the cross-section below. The first diagram shows the location of the drainage divide (dashed blue line), the cross-section (solid brown line with labels A at the southwest end and A' at the northeast end), and where groundwater generally flows in the overburden aquifer (thick blue arrows).





Cross Section A-A' showing generalized topography, geology, and groundwater flow. Elevation on the left is above mean sea level. The fractures depicted in the bedrock are schematic

C. History of Contamination

Originally, the property and much of the surrounding area was one property that contained a single family residence belonging to Mr. Alexander "Bud" Johnson. It is reported that from 1945 until 1958 Mr. Johnson transported drums to his property for storage and use. These drums contained wastes from industrial processes, primarily automobile production and painting. Mr. Johnson stored these drums to the rear (north) of his residence at that time.

Mr. Johnson sold several house lots from his property in the 1970s. Many of these new neighbors noticed the large stockpile of drums and notified the State of New Hampshire. During an initial investigation of the Site by State of New Hampshire personnel in 1982, it became apparent that the drums contained hazardous materials and had leaked onto the ground. Subsequent testing of the drums showed the presence of Volatile Organic Compounds (VOCs) such as acetone, toluene, benzene, xylene, trichloroethylene (TCE), tetrachloroethylene (PCE), 4-methyl-2-pentanone (also known as methyl isobutyl ketone or MIBK), and polychlorinated biphenyls (PCBs).

D. Initial Responses

Drum Removal

In 1984 the EPA, acting at the request of the State of New Hampshire, temporarily relocated the surrounding residents and removed 337 drums from the property that contained solvents, PCBs and other hazardous materials. During the removal EPA determined that the underlying soil was contaminated and that contamination of the groundwater was likely. Figure 4 on page 12 shows the location of the drum storage Areas A, B and C.

Soil Removal

Following a 1986 investigation into the extent of soil and groundwater contamination, EPA and the State of New Hampshire excavated over 405 yards of soil contaminated with solvents, PCBs, and other organic compounds in drum storage Areas B and C to a depth of approximately 6 feet. The soil was removed from the Site and disposed at a secure landfill. An additional 3.5 cubic yards of soil contaminated with the dioxin 2,3,7,8 TCDD was retained at the Site and destroyed in a mobile incinerator. The 3.5 cubic yards of soil were placed into twelve 55-gallon drums following on-site treatment and later disposed in a secure landfill. The areas of soil removal were backfilled with clean fill from an off-site source.[11] Former drum storage Area A did not have concentrations of soil contaminants that required removal.

Drinking Water Treatment Plant and Distribution System

At the time of EPA's initial response, all residents in Barrington, New Hampshire obtained drinking water through individual bedrock wells. Groundwater sampling indicated that Site contaminants were entering the residential wells and the concentrations were above those protective of human health.[12] In response to this contamination, EPA began construction of a drinking water treatment plant. EPA finished building the treatment plant and distribution system in 1988. The plant initially served 45 homes that were affected by the contamination.

[11] *Remedial Investigation, Vol. I*, p. 4-3 to 4-4.
[12] *Remedial Investigation, Volume II – Tables*, Table 4-15.

After one year of system "shake-down" EPA turned the treatment plant over to the State. The State then promptly turned it over to a group of residents in the affected area who formed the Swains Lake Village Water District (SLVWD) to operate the drinking water treatment plant. As part of the 1995 Consent Decree (1995 CD), the SLVWD and the Potentially Responsible Party (PRP) agreed to fund and continue to operate the treatment plant. To prevent the use of groundwater in areas where groundwater was contaminated, the SLVWD passed an ordinance forbidding the use of groundwater within an area identified for Institutional Controls (ICs). The ICs are described in greater detail in Appendix E.

Swains Lake, designated as a class "B" waterbody by the State, was used for drinking water by the SLVWD from 1988 to 2012. The problems created by recreational use are described in the 2008 Five-Year Review and prompted the SLVWD to explore other water supply sources. The SLVWD Commissioners and the PRP agreed to investigate the potential to establish a bedrock groundwater supply source on a property that abutted the drinking water treatment plant. Studies concluded that the bedrock wells were capable of supplying the SLVWD and were insulated from Site contamination. Two bedrock wells were installed in 2012 and the SLVWD is now supplied with drinking water from these wells exclusively.

Presently, the system supplies 3.5 million gallons of drinking water per year to 70 homes and a seasonal campground. The average daily demand is approximately 6,000 gallons per day for the residences and the balance of the usage is by the campground. The seasonal campground is approximately 3,000 feet north of the Site. The maximum daily demand is approximately 15,000 gallons. Figure 5 shows the location of the SLVWD water treatment plant, the wells that the water is extracted from, the extent of the current water distribution system, and the extent of the IC.

Figure 4. The Site, the monitoring network and former drum storage areas A, B and C.

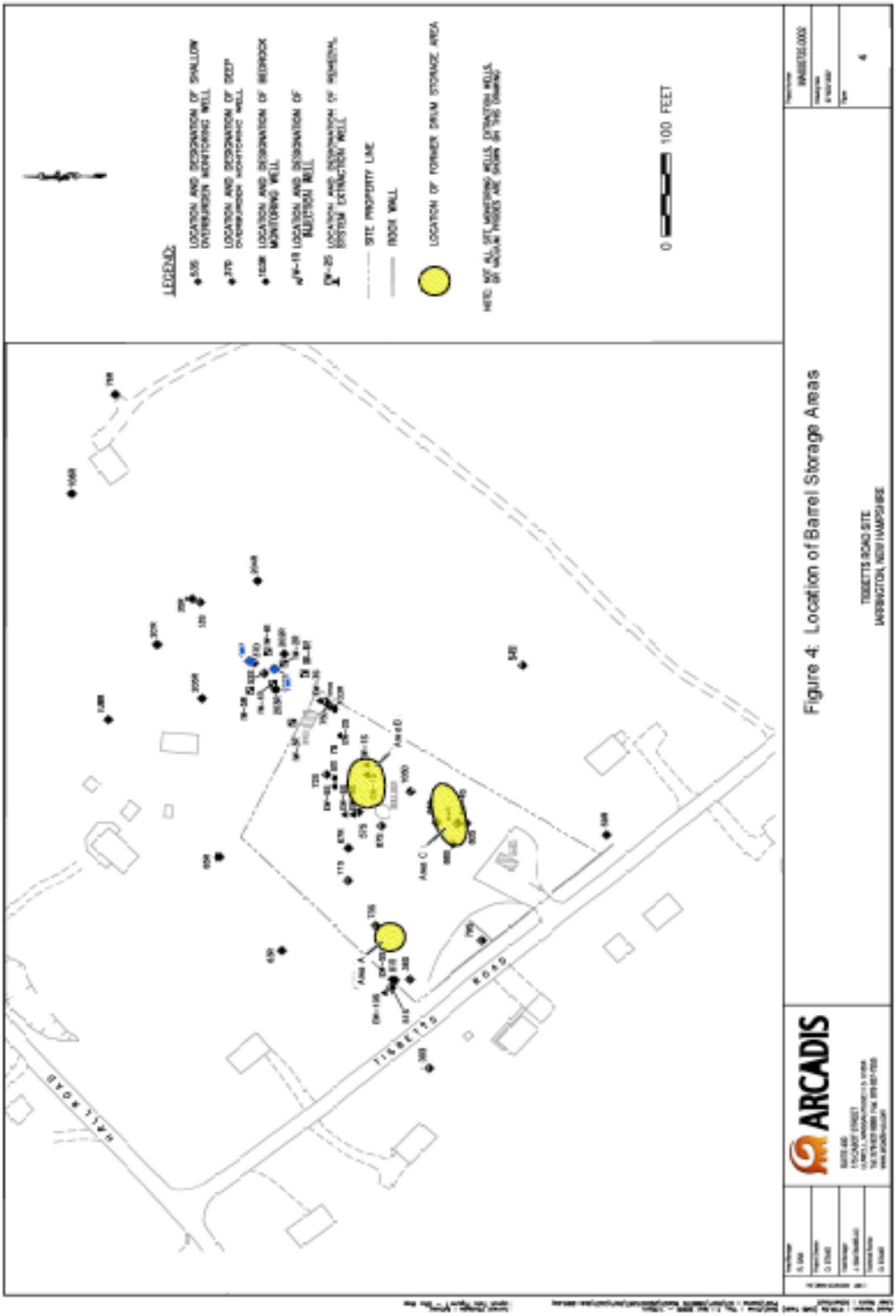
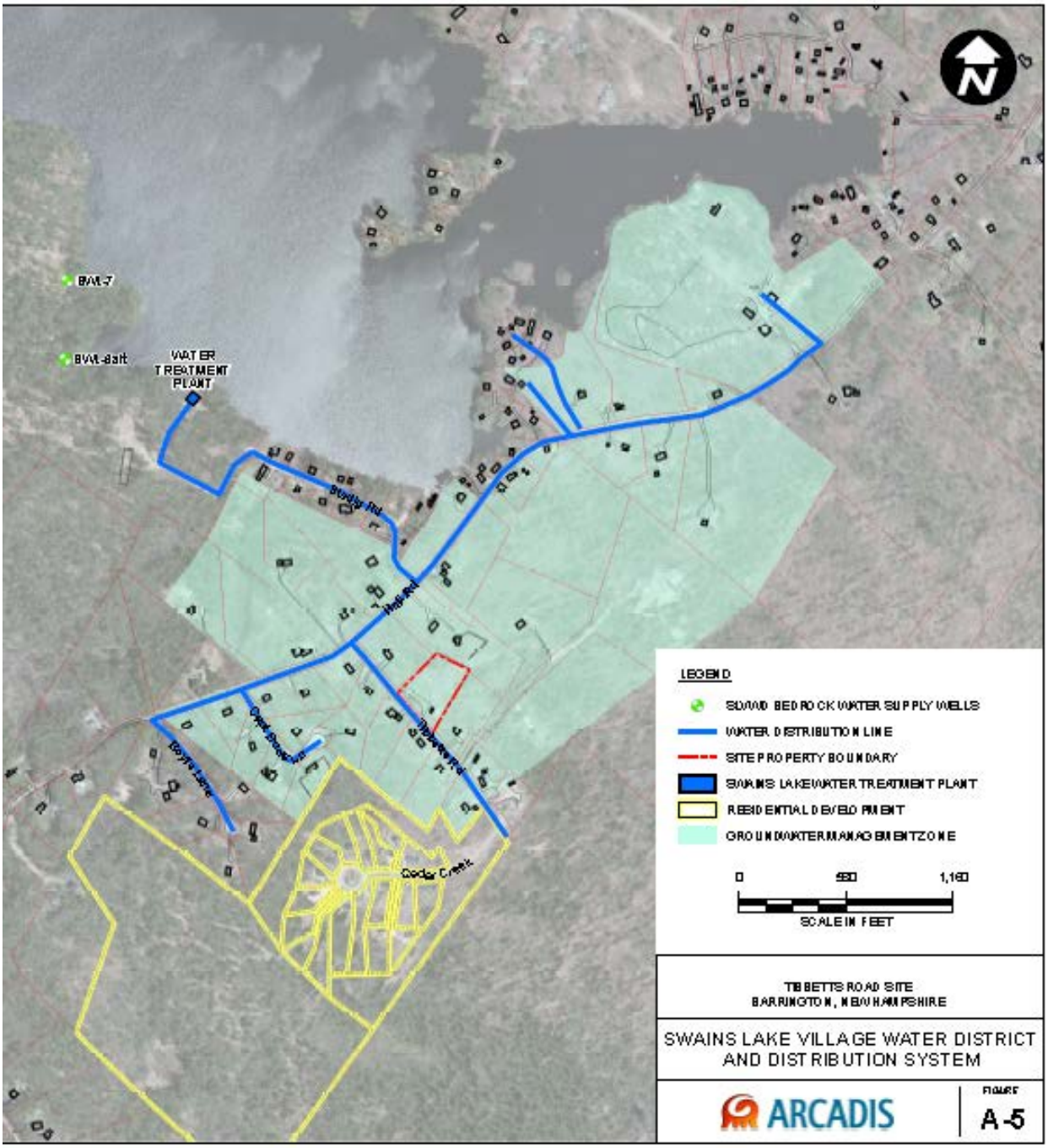


Figure 5. The location of the SLVWD treatment plant, the water supply wells, the distribution system and the extent of the IC.



E. Summary of Basis for Taking Action

Initial investigations conducted at the Site found contaminants that included VOCs, SVOCs, PCBs and dioxins in soils. Those investigations also found VOCs as well as metal contaminants such as lead, arsenic, and manganese in groundwater.

In 1989 EPA began a RI/FS to determine the extent of contamination that remained at the Site, if the contamination posed a risk, and what remedies would be effective at reducing or eliminating that risk. EPA finished the RI/FS in 1992 and held a public meeting discussing the findings.

The RI/FS found that due to the presence of VOCs and metals in groundwater at the Site, a risk existed for anyone who may use groundwater for domestic purposes in the future. No other exposure pathways to Site contaminants were found to generate an excess risk.[13] Moreover, the concentration of contaminants and conditions in groundwater made it likely that the groundwater contaminant plume would continue to migrate and contaminate other drinking water wells in the area.

The 1992 ROD documented the risk and established Interim Clean-up Levels (ICLs) for groundwater. These cleanup levels were proposed as "interim" to account for potential regulatory changes that may occur over the period of the remedy at the Site, in concentrations that are deemed to pose a risk. For instance, arsenic cleanup levels at the time of the ROD were established using the Safe Drinking Water Act (SDWA) Maximum Concentration Limit (MCL) of 50 parts per billion (ppb). Since that time, the SDWA MCL was lowered to 10 ppb and thus the cleanup level as well. Prior to documenting the Site to be remediated to acceptable levels, EPA will evaluate the ICLs and determine if the concentrations present in the groundwater are protective of human health and the environment. If levels are met, the ICLs will become the Final Cleanup Levels. Table 2 lists the present ICLs, their basis, and what the maximum concentration was in the groundwater contaminant plume prior to remediation.

[13] *Remedial Investigation, Vol. I*, p. 7-8 – 7-9.

Table 2: Groundwater Interim Cleanup Levels and Maximum Groundwater Concentrations prior to Remediation (1996)

Contaminant of Concern	Interim Cleanup Level (µg/l)	Basis of Interim Cleanup Level	Maximum Concentration in groundwater in 1996 (µg/l)[a]	
			Overburden	Bedrock
Inorganic compounds				
Arsenic	10[b]	MCL	446	80
Chromium	100	MCLG	353	221
Manganese	3,650[c]	Risk	44,500	11,400
Nickel	100	MCLG	252	80
Vanadium	256	Risk	290	90
Volatile Organic Compounds				
1,1,1 Trichloroethane	200	MCL	28	220
Trans-1,2 dichloroethene	100	MCLG	18,000	100
Cis-1,2 dichloroethene	70	MCLG	18,000	100
Bis(2-ethylhexyl)phthalate	4	MCL	8	240
Trichloroethene	5	MCL	27,000	3,000
Tetrachloroethene	5	MCL	3,200	11
Benzene	5	MCL	4,100	4,800
Toluene	1,000	MCL	140,000	9,000
Ethylbenzene	700	MCL	4,700	1,500
Xylene	10,000	MCLG	29,000	5,000
4-Methyl-2-pentanone	1,825	Risk	96,000	51,000
Naphthalene	1,460	Risk	440	145
Styrene	100	MCL	330	0

Notes:

[a] This represents the maximum concentration found at the Site during that time period.

[b] MCL of 10 became effective as of 22 February 2002 replacing the former value of 50 ppb.

[c] Current toxicity information indicates that the cleanup levels for manganese, 4-methyl-2-pentanone and naphthatlene arenot protective. Toxicity information for manganese and other contaminants of concern will will be reviewed prior to any remedy completion and set at a protective level.

IV. Remedial Actions

A. Remedy Selection

During the summer of 1992 EPA held an informational meeting to discuss the results of the Remedial Investigation (RI) and the cleanup alternatives presented in the Feasibility Study (FS). At that time EPA also identified the Agency's Proposed Plan for the cleanup of the Site and held a public comment period on the plan to solicit comments from interested members of the community. Since many of the earlier Removal Actions had dealt with the mitigation of the source areas at the Site, the main focus of the Proposed Plan was for the recovery and treatment of contaminated groundwater at the Site. After receiving and responding to comments from the public, the cleanup approach for the Site was finalized and documented in the September 29, 1992 ROD for this Site. The remedial action objectives (RAOs) identified for the Site in the 1992 ROD included:

- Eliminate or minimize the threat posed to human health by preventing the ingestion of contaminated groundwater.
- Prevent further migration of groundwater contamination to uncontaminated portions of the overburden and bedrock aquifers.
- Restore contaminated groundwater in the overburden and bedrock aquifers to Federal and State applicable or relevant and appropriate requirements (ARARs), including drinking water standards, such that consumption of groundwater is protective of human health.
- Prevent the dermal contact, ingestion, or inhalation of contents of 12 drums of incinerator ash and three VOC-contaminated barrels used for water filtration.

To meet these RAOs the 1992 ROD remedy included the following components:

- Upgrade and improve the existing drinking water distribution system.
- Dewater and treat, *in-situ*, contaminated aquifer matrix using a vacuum extraction system.
- Capture contaminated groundwater in the overburden and bedrock aquifers through the use of trenches and wells.
- Treat and remove inorganic and organic contaminants through flocculation and ultra-violet catalyzed oxidation.
- Discharge treated groundwater into the overburden and bedrock aquifers to enhance containment and recovery of contaminants.

B. Remedy Implementation

Drinking Water and Institutional Controls

Cleanup actions to protect public health began after EPA issued the 1992 ROD. In 1993, EPA extended a water line 3000 feet north along Hall Road to additional residences and a campground after contamination was found in those wells.

Under the 1995 CD Ford agreed to, among other items, conduct the cleanup of the Site as

specified in the ROD and to subsidize the SLVWD for a portion of its operating costs. Also under the 1995 CD, the SLVWD agreed to operate and maintain an alternate water supply for affected residences and to restrict the use of the groundwater in the impacted area through ICs.

To provide the ICs called for in the 1995 CD, the SLVWD enacted a local ordinance to prevent the use of groundwater at the Site as well as within the impacted area surrounding the Site. The enactment of the ordinance by the SLVWD also complied with the statutory requirements then identified under the State of New Hampshire's Groundwater Management Zone Regulations (Env-Ws 410) and present Env-Or 602.13. The extent of the area subject to institutional controls is shown in Figure 5 and a copy of the Ordinance is Attachment A to Appendix E.

Site Cleanup

In 1995 the PRP, through its contractor, ARCADIS, began cleanup actions. Among the first actions was removing twelve drums stored at the Site that contained incinerator ash and three VOC-contaminated barrels used for water filtration. The 15 drums were transported off-site for disposal at a RCRA Subtitle C landfill in Model City, New York. The original, heavily fire-damaged, Johnson residence at the Site was demolished and the debris disposed of at a RCRA Subtitle D landfill in Rochester, New Hampshire.

Groundwater Remediation

The 1992 ROD selected vacuum extraction in the overburden aquifer and groundwater extraction and treatment in the bedrock aquifer to address groundwater contamination at the Site. The PRP began performing this component of the 1992 ROD remedy in the summer of 1995 as a vacuum enhanced groundwater recovery (VER) system removing and treating both soil vapor and groundwater from the overburden aquifer. The remedy was expanded and operated through 1997. The vacuum extraction wells were positioned within the overburden aquifer primarily in and around the three source areas (drum storage areas A, B, and C) at the Site identified in Figure 4. The Site was also paved within the area of influence to reduce infiltration from the surface and enhance the effectiveness of the VER system.

Over its operational lifetime, the VER system removed and treated approximately 800 pounds of contaminants from the groundwater. During its peak operation, the VER system removed as much as 3.5 pounds of contaminants per day. Shortly before the system was shut down in 1997, the system was removing less than one ounce of contaminants per day.[14] The recovery of contaminants met the criteria in the 1995CD to discontinue the VER. The recovery system was optimized to ensure that areas of high concentration in the overburden aquifer were addressed.[15] The VER system attained the ICLs for VOCs as identified in the 1992 ROD and Table 2 of this Five-Year Review beneath drum storage Area C.[16] In addition, VOC concentrations in the overburden aquifer beneath drum storage Area A were significantly reduced and were approaching cleanup levels at the time the VER system was shut down.[17]

[14] **Note**: Although higher estimates were provided in subsequent documents, these figures were calculated at the time of the Construction Completion Report in 1998 and are believed to be the last, accurate estimates.
[15] *Findings of Subsurface Investigation, Tibbetts Road Site*, July 1997 (Geraghty & Miller, Inc (ARCADIS): Andover, MA).`
[16] *Tibbetts Road Superfund Site Amended Record of Decision*, September 28, 1998 (USEPA,RegionI,Boston) p. 12.
[17] *Amended Record of Decision*, p. 11.

Because the VER system had met the contaminant recovery standards set forth in the 1995 CD Scope of Work,[18] and the recovery efficiency of the VER system declined to less than one ounce per day, EPA considered other cleanup methods for the Site including pulsed hot-spot treatments using VER, bioremediation, and phytoremediation. After evaluating the alternatives, it was agreed by EPA, NHDES and Ford to implement all three alternatives as the situation dictated.

Bioremediation was shown, through microcosm work of Dr. John Wilson of EPA's Ada laboratory, to be a significant contributor to contaminant reduction at the Site before remedial efforts began.[19] Bioremediation's importance was the initial consideration in selecting the phytoremediation remedy. In this instance, bioremediation required slower groundwater travel times to effectively degrade contaminants. The phytoremediation remedy was installed primarily to lower the water table and thus decrease infiltration and thereby slow the groundwater flow.

As a result, the 1992 ROD was amended on September 28, 1998 (1998 AROD) to change the overburden groundwater remedy to bioremediation and phytoremediation with limited "hot spot" remediation. Approximately 1,600 poplar trees (one-year old *Deltoides x Nigra* hybrid) were planted on the 1.9-acre site in May 1998 after the removal of the asphalt cap. The trees, which were three to five feet tall "whips" at the time of planting, were planted in rows which are ten feet apart and at intervals of one tree every three feet. With the planting of the poplar trees, all construction activities associated with phytoremediation at the Site were completed; however, maintenance of the trees would be required. No additional activities were required to implement the bioremediation component of the 1998 AROD since it is a natural process which was already occurring at the Site. The Preliminary Close-Out Report was signed by EPA on September 29, 1998, signifying the completion of construction activities at the Site.

With respect to the bedrock groundwater pump-and-treat remedy in the 1992 ROD, during the design and construction of the overburden VER system, it became apparent that the removal of groundwater from the weathered bedrock aquifer would increase downward groundwater gradients. It was believed that this would increase the introduction of the more highly contaminated groundwater from the overburden aquifer and exacerbate the contamination in the weathered bedrock aquifer. Therefore, it was determined that recovery of bedrock contaminants would be coordinated to not interfere with the recovery of contamination in Area B. The 1998 AROD also amended the proposed pump-and-treat remedy in the weathered bedrock to include a bioremediation remedy that would be monitored to determine whether other *in situ* measures were necessary.[20]

In 2001, despite significant reductions in contaminants in the overburden groundwater at the Site, concentrations in the weathered bedrock remained very high. Because concentrations in Area B were low and based on monitoring it appeared that the mass of the plume was small, it was believed that low-scale pump-and-treat would be effective in reducing the concentrations quickly. A submersible pump was installed at monitoring well 169R (the most highly contaminated area) and operated from August 21, 2002 to November 4, 2002 removing

[18] *Consent Decree*, Appendix B, Section VII. B., p. 39 – 46.
[19] *Amended Record of Decision*, p. 5, 6, and 10 – 14, and Appendix D.
[20] *Amended Record of Decision*, p. 28.

contaminants. Based on the results of pumping it was believed that an *in situ* chemical oxidizing agent (ISCO) may provide a better alternative to reduce concentrations.

An ISCO pilot injection program began on November 2, 2003 with the injection of approximately 100 gallons of sodium permanganate solution into wells positioned in the weathered bedrock just north of the Site property line and drum storage area B. An additional injection of approximately 55 gallons of sodium permanganate was completed on December 30, 2003. The conclusion and recommendations of the initial pilot treatment was that the sodium permanganate was successful in reducing both chlorinated and non-chlorinated VOCs and that future applications may be useful, but will require longer reaction times for both the chlorinated and non-chlorinated VOCs.[21]

ARCADIS performed a second phase of ISCO pilot injections in June and November of 2006. The 2006 application expanded on the 2003 injections by sealing the perimeter wells and injecting the oxidizer under pressure into wells screened across both the overburden and bedrock aquifers. A recirculation system extracted and re-injected groundwater to increase the hydraulic gradient as well as aid and control the distribution of the sodium permanganate. Although it was found that ISCO successfully reduced the concentrations of many of the target compounds, benzene was not reduced in concentration to a significant level and it was determined that additional applications of sodium permanganate would not be effective.[22]

The 1992 ROD estimated that it would take approximately twenty years to attain the interim cleanup levels in both the overburden and bedrock aquifers.[23, 24] The 1998 Amended ROD estimated that the interim cleanup levels would be attained in 14 years (2012).[25] As described in Appendix D, cleanup levels were not attained in 2012. In addition to arsenic, several VOC contaminants, although greatly reduced from pre-remedial concentrations, still exceeded ICLs.

Monitoring had demonstrated that bedrock groundwater had not migrated until a subdivision, Cedar Creek, was built and several homes had begun withdrawing groundwater for domestic use. The Cedar Creek homes were built just outside the limit of the area where drinking water wells were prohibited. The drinking water wells were all bedrock wells that were greater than 200 feet in depth and accessed the local fracture system in bedrock. Moreover, they were clustered, the majority of the 16 wells are within 200 feet of each other, increasing their impact. The migration of Benzene, one of the key VOC contaminants, is shown in Appendix D as Figure D3 and demonstrates the degree of connection of bedrock fractures in the area. It also demonstrates the failure to attain the RAO for preventing contaminant migration described on page 16. The means to address this issue is described in the Technical Assessment section below.

In 2012 ARCADIS proposed an additional pilot study to assess the effectiveness of a directed

[21] *In-Situ Chemical Oxidation Pilot Test Interim Report and Supplemental Work Plan*, May 2005 (ARCADIS: Lowell, MA) p. 20 – 22.
[22] *In-Situ Chemical Oxidation Pilot Testing, Tibbetts Road Site…*, May6, 2008 (ARCADIS: Lowell, MA) p. 7 & 8.
[23] *Tibbetts Road Site Feasibility Study Report, Volume I: Text*, June 1992 (CDM Federal Programs Corporation, Boston, MA) p. 3-23.
[24] *Tibbetts Road Site Feasibility Study Report Appendices*, Appendix B, June 1992 (CDM Federal Programs Corporation, Boston, MA).
[25] *Amended Record of Decision*, p. 26.

groundwater re-injection of sodium persulfate *in situ* treatment in the bedrock. Due to access issues the pilot study was delayed until summer 2013. Activated sodium persulfate was selected as an oxidant for the VOCs and benzene, and to co-precipitate arsenic and iron in an insoluble sulfide complex. EPA has approved the work plan for this effort which is summarized in Appendix D.

C. Operations and Maintenance

The continuing operation and maintenance (O&M) activities required for the remedy as described in the 1998 AROD consist of:

- Maintaining the trees for the phytoremediation remedy in the overburden aquifer.
- Performing "hot spot" remedial actions as needed in the overburden aquifer.
- Assessing progress of the bedrock remedy and assessing additional measures as necessary.
- Performing the required environmental monitoring for bedrock and overburden aquifers.
- Insuring that the drinking water treatment plant is able to supply domestic water to the contaminated area.

During the first few years after planting in 1998, the trees were irrigated, fertilized, pruned, and protected from pests. As the trees have matured, the level of O&M needed to maintain them has diminished. At the time of the writing of this Five-Year Review, many of the trees at the Site are over 40 feet tall and have well-established root systems. Accordingly, the need for irrigation has been eliminated and the effort required to fertilize and control pests has been reduced significantly. Over the next several years, pruning and thinning will be the major O&M activity required for the trees as they continue to grow.[26]

With respect to the operation and maintenance of the drinking water treatment plant, the operators of the SLVWD maintain and monitor the treatment facility, service the distribution lines, and ensure compliance with the IC provisions. To supply drinking water to residents within the service area, groundwater is now withdrawn from two wells west of Swains Lake, infiltrated through sand filters at the treatment plant, treated to remove pathogens with ultraviolet light, chlorinated, passed through granular activated carbon filters, and chlorinated once again before entering distribution lines.

[26] *Phytoremediation Installation Report, Tibbetts Road Site*, December 1998 (ARCADIS: Lowell, MA).

V. Progress Since the Last Review

EPA completed the last Five-Year Review in August 2008. During that Five-Year Review EPA found that the remedy was functioning as set forth in the 1998 AROD, that cleanup levels remained protective, and that no new information was available that would question the protectiveness of the remedy. Four primary concerns were identified in the 2008 Five-Year Review:

1. Remaining groundwater contaminants in both the overburden and bedrock aquifers posed a long-term threat to drinking water.
2. The overburden groundwater VOC contamination, although very low, created the potential for vapor intrusion of VOCs into nearby homes.
3. The high contaminant concentrations in bedrock groundwater and the interconnected nature of the bedrock fractures created the potential for migration of bedrock contaminants due to withdrawals by groundwater users outside the limits of ICs.
4. Long-term viability of the drinking water treatment plant. The Commissioners had outlined a number of concerns: the declining quality of the surface water supply, the tightening of standards for drinking water, increasing water demand, and the age of the equipment.

To meet these concerns and in order for the groundwater remedy to be protective for the long-term, EPA recommended several actions in the 2008 Five-Year Review. The issues, recommendations, and the actions to be performed are outlined in Table 3.

Table 3 Issues, Recommendations and Follow-up Actions from 2008 Five-Year Review
Adapted from Table 5 of 2008 Five-Year Review

Issue	Recommendation	Actions Performed to Address Recommendation
1) Cleanup levels for contaminants in overburden and bedrock aquifers will not be attained by the predicted date of 2012.	Remove source areas in overburden soils and conduct treatability studies in bedrock.	ARCADIS submitted a work plan to remove overburden aquifer soils in 2012, but the landowner blocked implementation. The homeowner's issues are resolved and the soil removal and assessment will proceed during the summer of 2013.
	Evaluate additional bedrock groundwater remedies to address high concentrations.	Access issues prevented the treatability study that will isolate contaminated zones and re-circulate oxidizing compound (persulfate) in 2012. Those issues are resolved and will be performed during summer 2013.
2) Vapor Intrusion Pathway not fully characterized.	Collect data to investigate this potential exposure pathway.	A February 2012 report found this pathway incomplete. EPA concurred with that conclusion.
3) Additional bedrock aquifer withdrawals may cause bedrock contaminant migration.	Continue monitoring groundwater and review monitoring program.	Bedrock groundwater monitoring was expanded with additional, deeper wells using FLUTe system and multi-level wells to isolate the complex bedrock fracture system.
4) Drinking water treatment plant water quality issues.	Switch to an alternate source of water.	In 2012, the SLVWD switched from a surface water supply to a groundwater supply. Equipment at the treatment plant was upgraded accordingly.

A problem with Issue #3 in Table 3 was realized in 2011. An 18-lot subdivision, formerly titled "Sera Lane" and now titled "Cedar Creek," began construction in 2005 approximately 250 meters south of the Site and just beyond the edge of the IC. Historical groundwater monitoring had shown this area to be uncontaminated and thus not part of the IC. Although the developer sought connection to the SLVWD when construction began, the issues identified for the drinking water plant at that time, described in Section III D. and the 2008 Five-Year Review, prevented hookup. The builder subsequently installed bedrock drinking water wells to serve the new homes beginning in 2010.

As part of the issues identified in the 2008 Five-Year Review, ARCADIS began monitoring the bedrock wells installed for the new homes in addition to the wells in the sampling program. In December 2011, ARCADIS advised EPA that two of the wells had detections of Site contaminants that exceeded their respective ICLs. ARCADIS notified the homeowners, provided bottled water, increased the sampling frequency of the Cedar Creek homes to a quarterly basis, and began exploring water treatment options.

Currently, 16 of the 18 permitted homes have been built and use groundwater for domestic purposes. As of this report, five homes have been identified with Site contaminants. The concentrations of contaminants in the water of these homes are higher than background and four have one or more VOCs that exceed their respective ICLs. All five affected homes have treatment systems installed that use granular activated carbon to remove contaminants. Analysis of the treated water shows that the units are effective and Site contaminants are reduced below cleanup levels. A discussion of contaminants and trends in these wells is contained in Appendix D.

With the water supply issues resolved at the SLVWD, the SLVWD Commissioners and the PRP are receptive to extending the SLVWD service to the Cedar Creek development. The migration of contaminants from the Site to the Cedar Creek development indicates the need to expand the area of ICs to stop further migration.

VI. Five-Year Review Process

A. Administrative Components

The Remedial Project Manager, Darryl Luce, conducted the Tibbetts Road Superfund Site Five-Year Review with assistance from Ken Richards, NHDES Project Manager and ARCADIS, consultants to Ford Motor Company. The Five-Year Review consisted of:

- Reviewing relevant documents listed in the reference section of this document;
- Conducting a review and technical assessment of data collected during implementation of the selected remedy, and;
- Performing interviews and a Site inspection.

B. Community Notification and Involvement

EPA, the State and ARCADIS held a public meeting on February 20, 2013 regarding the Five-Year Review for this Site. The EPA published a notice of the initiation of the Five-Year Review in the local newspaper, the Union Leader, in February 2013 noting that the Five-Year Review process will be completed and publicly available in August 2013. A copy of the public notice is included in Appendix A.

The level of community interest in the Site has been low within the last decade. Interest has recently increased due to the contamination of several drinking water wells in a new subdivision, Cedar Creek Road, just beyond the limit of the area of ICs. Several Cedar Creek residents attended the public meeting on February 20, 2013. Further details of that meeting are provided in Section F, below.

C. Document Review

This Five-Year Review consisted of a review of relevant documents including O&M Records and monitoring data. The 1992 ROD and 1998 AROD and various literature sources were also consulted. A list of references is provided at the end of this Five-Year Review.

D. Data Review

The EPA analyzed trends in groundwater and other media from the Site and surrounding area. No Site contaminants have been found in surface water bodies surrounding the Site, including Swain's Lake. Air monitoring, conducted prior to and during the active VER groundwater remediation, showed no contaminants in the air. Groundwater remains the sole contaminated media at the Site.

VOC contaminant levels in the overburden aquifer beneath most areas of the Site appear to be at or approaching the ICLs identified in the ROD and Amended ROD. One well in the overburden aquifer in the area of former drum storage Area A has exhibited fluctuating concentrations which have been above its respective ICL. Remaining overburden wells immediately adjacent to Area A have maintained concentrations well below cleanup levels. The overburden soil and shallow aquifer removal performed in early summer 2013 should address the remaining overburden contamination. A small portion of the weathered bedrock aquifer located to the northeast of Area B has shown more limited progress in achieving the required cleanup levels for VOCs. There are a few wells in this area that remain significantly above ICLs.

The shallow bedrock aquifer (40-60 ft) on the northern border of the Site has shown significant reductions in the concentrations of contaminants of concern since the injection of sodium permanganate as a pilot test between 2003 and 2006. However, the deeper bedrock aquifer (60 to 165 ft), as determined from recent drilling in 2011 and 2012, still presents a challenge with respect to remediation. Groundwater is being monitored in the more highly fractured intervals of the deep bedrock in this area (based on geophysical and pump test data), and a plan has been developed for the injection of persulfate and the use of directed groundwater recirculation to treat contaminants of concern.

Inorganic contaminants, primarily arsenic and manganese, exceed ICLs in both the overburden and bedrock aquifers. Because of the nature of the wastes discharged at the Site, arsenic and manganese are believed to originate from the native aquifer matrix and are the result of changes which took place in the subsurface environment due to the VOC contamination. In particular, the discharge of contaminants high in organic carbon caused the aquifer to become anaerobic. This environment caused the arsenic and manganese to be liberated from the soil and native rock.[27] It is expected that as ICLs for organic contaminants are met throughout the aquifer, the ICLs for arsenic and manganese will also be attained.

A more complete analysis of contaminant conditions and trends at the Site is in Appendix D - Technical Assessment to this Five-Year Review.

E. Site Inspection

Darryl Luce (USEPA) conducted a Site visit on February 20, 2013. No hazards were found during that inspection. During the interviews the SLVWD Commissioners asked that the storage shed and port-a-john at the Site be repaired or removed. The poplar trees planted as part of the phytoremediation remedy appeared to be healthy and the ground surface appeared to be undisturbed. Some of the trees had sustained snow damage, but appeared to be re-growing.

EPA also conducted a review of the Site Health and Safety plan and OSHA-certification and medical monitoring for sampling personnel at the ARCADIS office. All administrative aspects of Site remediation, including the maintenance of environmental liability insurance, appear to be satisfied at the time of this review. The Site inspection activities are documented in a checklist and photolog included as Appendix B and C, respectively.

F. Interviews and Public Input

To conduct interviews, EPA and NHDES held consecutive meetings on February 20, 2013 with representatives of Ford Motor Company and the SLVWD Commissioners in the afternoon and with members of the public and public officials in the evening. Generally, no issues were raised that impact the protectiveness of the remedy. Concerns were voiced regarding future new subdivisions that may use groundwater and, that while outside of the area of ICs, may cause migration of Site contaminants. The specific comments follow:

<u>Interview with John Scrunton, Town Administrator, Town of Barrington, New Hampshire</u>
On January 9, 2013, Darryl Luce interviewed John Scrunton, Town Administrator for the Town of Barrington, over the telephone. Mr. Luce updated Mr. Scrunton regarding the Site and Mr. Scrunton recommended several people to invite to the planned public meeting. Mr. Scrunton had no issues with the current conditions of the Site.

<u>Interview with Ford Motor Company and Swain's Lake Village Water District</u>
In the afternoon of February 20, 2013 Ken Richards of NHDES and Darryl Luce, the EPA Site project manager, met with Chuck Castelluccio of ARCADIS and Chuck Pinter of Ford Motor

[27] Hounslow, A.W. *Ground-water geochemistry: arsenic in landfills.* Ground Water 18: 331-333 (1980).

Company, as well as Dick Maier, Stan Swier, and Phil Treadwell, the SLVWD Commissioners and operators. The group was joined by Norm Boucher, a former SLVWD Commissioner and adjacent property owner to the west of the Site. The discussion focused on the recent conversion from surface water to groundwater source and the potential for extending the water system to Cedar Creek. The Commissioners stated that the new water supply is superior and expressed great satisfaction with the finished product. They also expressed the need to assess the current treatment system to service additional users beyond the Cedar Creek residents. At the time of this meeting no issues were identified that would compromise the effectiveness of the remedy.

Public Meeting

During the evening of February 20, 2013, Ken Richards and Darryl Luce, the NHDES and EPA Site project managers, respectively, met with members of the public and town officials. Also present at the meeting was Chuck Pinter of Ford Motor Company, Chuck Castelluccio of ARCADIS, the consultant for Ford. Members of the local community and Barrington Town Officials were also invited to attend that meeting.

In an introductory address, Mr. Luce stated that although much progress had been made at the Site and that no current risk existed, groundwater still exceeded cleanup levels and would likely into the future. The meeting focused on planned activities for the coming field season. There were a few residents from the Cedar Creek subdivision and some questions were raised about drinking water from the wells and future considerations for connecting to the SLVWD.

Public Input

No written concerns were expressed regarding the Site, either electronically or through traditional mail. On August 1, 2013 a letter was received from Stephen Buckley, representing the SLVWD. In that letter Mr. Buckley conveyed the concerns and desires of the SLVWD Commissioners to extend the area of ICs to prevent contaminant migration. That letter is contained in Appendix E as Attachment C.

G. Re-Use Assessment

Currently, the Site appears to be a vacant lot within an area of light residential development. No one has paid taxes on the property for more than 20 years. The property and its current conditions are shown on Figure 2 and photographs supplied in Appendix C. There are few uses the property could be returned to presently because the majority of the 1.9 acre Site is occupied by poplar trees, an element of the groundwater remedy. Once ICLs are attained there will be nothing to prevent the lot from being returned to a residential use.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

YES – The active components of the cleanup remedy as described in the ROD (e.g., VER system, expansion of the alternate water supply, institutional controls, and disposal of remaining drums stored at the Site) and as later modified in the Amended ROD (e.g., bioremediation and phytoremediation) have been implemented and the results of groundwater monitoring indicate that the current remedy is functioning as intended. However, the restoration timeframe to attain the ICLs in the 1998 AROD will take longer than anticipated.

The trends seen in the groundwater for the Site for inorganic contaminants, primarily arsenic and manganese, are not as clearly evident at this time. As stated in Section VI. D. it is believed that the increase in arsenic and manganese is the mobilization of native minerals and that once ICLs for organic contaminants are attained, inorganic ICLs will be attained as well.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

YES - Data provided and analyzed in Appendix D indicate no change in Site conditions which would warrant a re-evaluation of risk. However, in February 2002, EPA revised the MCL for arsenic from 50 parts per billion to 10 parts per billion. This will likely further extend the estimated timeframe for reaching cleanup goals. This change will not affect the risk calculated at the Site; however, it is a relevant and appropriate requirement. Table 4 details the change in MCL.

The 1992 ROD established an ICL of 3,650 ppb for dissolved manganese in groundwater based on human consumption over a 30-year period. That ICL was retained in the 1998 AROD. However, based on current toxicity information, the protective cleanup level for manganese is 300 ppb. Changes in toxicity information for other chemicals, including 4-methyl-2-pentanone and naphthalene, will be used to ensure cleanup levels are protective. EPA will need to prepare the appropriate decision document to formally document these changes to the 1992 ROD and 1998 AROD.

Table 4: Changes in Chemical-Specific Standards

Contaminant	Media	Cleanup Level	Standard		Citation/Year
Arsenic	Groundwater	10 ug/L	Previous	50 ug/L	SDWA 1988
			New	10 ug/L	SDWA 2002

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

YES – Since the last 5-year review, bedrock drinking water wells were installed to service homes in a new subdivision just beyond the limit of the IC. The pumping of these wells caused contaminants to migrate and five homes were subsequently identified with Site

contaminants. All five homes have since received treatment systems and the limits of the current IC will be extended to include this subdivision. In addition, the area of ICs will be expanded to cover those areas identified that may cause further migration of contaminants.

Technical Assessment Summary

Inorganic and organic contaminants exceed ICLs in limited areas of the overburden and bedrock aquifers. The lateral extent of the overburden groundwater contamination is limited to one well within Area A. Within Area A, wells within 20 feet of the contaminated well, are below ICLs. Bedrock VOC groundwater contamination is limited to an area north of the property boundary.[28] However, because of bedrock fracture flow, groundwater use near the Site, but outside the IC, has caused those contaminants to migrate. Although active groundwater remedial efforts have greatly reduced concentrations in the overburden and bedrock groundwater, additional work is required to reduce contamination to below ICLs.

Arsenic and manganese are present in many wells in both the overburden and bedrock groundwater. Although no work has been done thus far to demonstrate the origin of the arsenic or manganese, it is believed that they were the result of altered environmental conditions causing natural arsenic and other metals to dissolve from the aquifer matrix.[29] It is expected that as conditions in the aquifer return to their natural state, the present reducing environment will become an oxidizing environment and the metals will precipitate and not pose a risk.

The construction of a subdivision adjacent to, but outside the boundary, of ICs since the last 5 Year Review has caused contaminated groundwater in the bedrock to flow southwestward. There is no current risk posed from Site contaminants to these drinking water users, since in-home treatment systems were installed at the affected (five) homes along Cedar Creek. Future risk may occur if contaminated groundwater is used for drinking water purposes. This may occur if the treatment units are not maintained, or if contaminants flow to wells used by the other homes in the subdivision, or if another subdivision is built nearby that uses groundwater at a sufficient rate to induce contaminant migration. Therefore, to prevent future risk the primary measures will include:

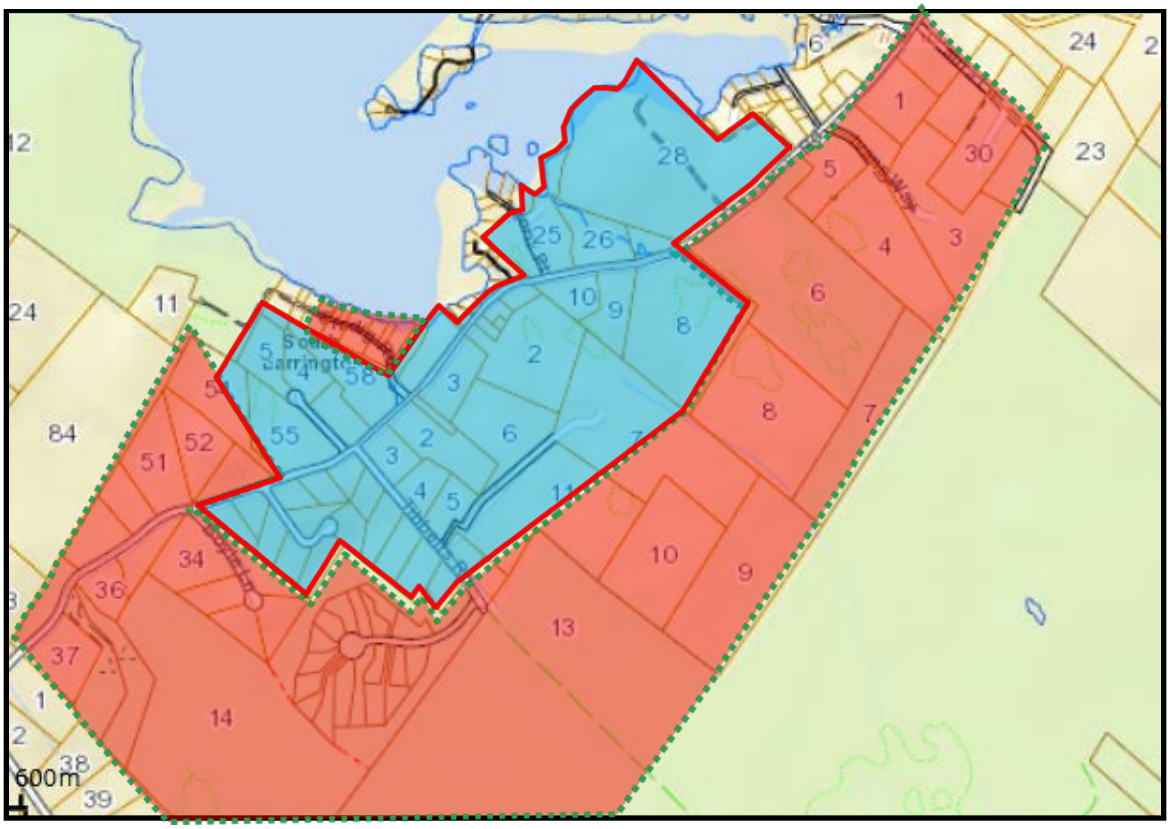
- Ensure the homes on Cedar Creek maintain their treatment systems. Those systems are maintained and water is tested quarterly.
- Continue monitoring domestic water in homes on Cedar Creek that do not have treatment systems. Those wells are sampled annually.
- Extend the water supply from the SLVWD to the homes on Cedar Creek.
- Enlarge the IC to prevent new groundwater users within those areas that may induce migration.
- Determine and implement means to address the remaining bedrock groundwater contamination.

A more detailed analysis of Site conditions is presented in Appendix D. The expansion of the

[28] *Evaluation of Current Biogeochemical Conditions and Applicability of Monitored Natural Attenuation*, Tibbetts Road Site…December 2007 (ARCADIS: Lowell, MA) p. 5 – 13.
[29] Hounslow, A.W. *Ground-water geochemistry: arsenic in landfills*. Ground Water 18: 331-333 (1980).

area of ICs to prevent the migration is described in Appendix E and depicted in Figure 6, below.

Figure 6. Proposed expansion of Institutional Controls to prohibit the use of groundwater and prevent the migration of contaminated bedrock groundwater. The current limit of Institutional controls is shown in blue, the proposed expansion is shown in orange.



VIII. Issues

The primary issue identified in this Five Year Review is the continuing contamination in the bedrock groundwater that can migrate through the fracture system to groundwater users outside the current limit of ICs. Groundwater contamination in the overburden is low and insufficient to further contaminate the bedrock aquifer. The contaminated domestic wells on Cedar Creek demonstrate that the contamination in the bedrock has the potential for off-site migration through bedrock fractures.

The 1992 ROD and 1998 AROD predicted that remedial actions at the Site would attain cleanup levels in overburden and bedrock aquifers by 2012. Significant concentrations of contaminants remain in the bedrock. There is an approved work plan for a treatability study to address those contaminants and assess the effectiveness. In addition to currently exceeding the ICLs for VOCs, the drinking water standard for arsenic was lowered from 50 parts per billion to 10 parts per billion in 2002 at both the Federal and State levels. Further work is required to address bedrock groundwater contamination. Table 5 summarizes the remaining issues at the Site identified as potentially, negatively affecting the protectiveness of the remedy.

Table 5: Summary of Issues

Issues	Affects Protectiveness	
	Current	**Future**
1) Contamination in bedrock aquifer remains elevated and can migrate naturally or due to pumping outside the area of ICs.	No	Yes
2) Clean up levels were not attained by 2012 for all of the contaminants and the arsenic MCL changed from 50 ppb to 10 ppb.	No	Yes

IX. Recommendations and Follow-up Actions

The issues identified above point to a number of actions that need to be taken to ensure long-term protectiveness at the Site. Table 6 lists the recommendations and follow up actions for this Five-Year Review.

Table 6: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1	Abandon all drinking water wells on Cedar Creek and provide water through an alternative means.	PRP, SLVWD	EPA	March 2015	N	Y
1	Evaluate the potential for, and the area in which, additional groundwater withdrawals outside of the area of ICs may cause bedrock contaminants to migrate.	PRP	EPA	January 2015	N	Y
1	Expand the area of ICs to include areas outside of the IC where the installation of wells may cause further migration of bedrock contaminants.	SLVWD, Town of Barrington	EPA	July 2015	N	Y
2	Evaluate other options to address high concentrations that remain in bedrock. The following activities will be components of this effort: a. Perform pilot study to oxidize and immobilize contaminants using persulfate compound. b. Sample to evaluate effectiveness. c. Determine potential cleanup alternatives.	PRP	EPA	a. Summer 2013 b. Annual Monitoring c. Spring 2015	N	N
2	Excavate overburden soils and aquifer matrix to remove low-concentration source areas. Perform additional groundwater and geochemical investigation to determine appropriate cleanup times and controls on contaminants. The following activities will be components of this effort: a. Excavate contaminated soils. b. Sample to evaluate effectiveness. c. Determine potential cleanup dates.	PRP	EPA	a. Spring 2013 b. Annual Monitoring c. Spring 2015	N	N

X. Protectiveness Statement

The remedial actions taken are protective of human health and the environment in the short-term because there are no completed exposure pathways. However, to be protective in the long-term, a number of follow-up actions are necessary: extend the current drinking water system to an existing residential subdivision impacted by bedrock groundwater contaminants, install additional bedrock monitoring wells and perform hydrologic analysis as directed by the approved work plan to determine the limit of influence on the Site bedrock groundwater contaminants, expand institutional controls through a municipal ordinance to include areas that may influence the migration of contaminants in bedrock groundwater, evaluate additional measures to reduce bedrock groundwater concentrations and implement those that are successful, and remove soils in an area of overburden groundwater contamination.

XI. Next Review

This Site requires on-going, policy, Five-Year Reviews. The next review will be conducted and issued in 2018, five years from the date of signature of this report.

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APPENDIX A: PUBLIC NOTICE TO START FIVE-YEAR REVIEW

EPA Starts Five-Year Review of Tibbetts Road Superfund Site

The U.S. Environmental Protection Agency (EPA) is beginning its third Five-Year Review of the Tibbetts Road Superfund Site, in Barrington, NH. Five-Year Reviews are required by law to determine if the cleanup is protective of human health and the environment. This Five-Year Review will be completed by August 2013 and the results will be publicly available.

The Tibbetts Road Superfund Site cleanup plan included the removal of the deteriorated and leaking drums, soil excavation, vacuum extraction and pumping and treating of groundwater, and the planting of poplar trees to reduce groundwater flow and enable micro-organisms to consume contaminants. Current efforts will reduce bedrock contamination through chemical treatments. Contaminants at the site included solvents, PCBs, and dioxin in the soil. Volatile Organic Compounds exist in the groundwater. Since 1987, residents with wells contaminated from the site have received clean water from a water supply system.

More information about the cleanup can be found on-line at www.epa.gov/superfund/sites/tibbetts or at the Barrington Public Library, 105 Ramsdell Lane, Barrington.

For more information, contact:
Darryl Luce
Toll Free 1-888-372-7341, ext.81336
luce.darryl@epa.gov
www.epa.gov/superfund/sites/tibbetts

APPENDIX B: INSPECTION CHECKLIST

Site Inspection Checklist

I. SITE INFORMATION

Site name: Tibbetts Road	**Date of inspection:** 20 February 2013
Location and Region: Barrington, NH; EPA Region I	**EPA ID:** NHD989090469 **NH Site ID:** 0101208
Agency, office, or company leading the five-year review: EPA Region I	**Weather/temperature:** Cloudy, cool but dry, temperature approximately 20° Fahrenheit. Snow present on the ground.

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☑ Access controls
- ☑ Institutional controls
- ☑ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☑ Other____phytoremediation _____
- ☑ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☑ Site map attached

II. INTERVIEWS

1. **O&M site manager:** Charles Castelluccio (Name) Project Manager, ARCADIS, Inc. (Title) February 20, 2013 (Date)
   Interviewed ☑ at site ☐ at office ☐ by phone Phone no. 781-213-4962
   Problems, suggestions; None, O&M restricted to keeping area neat and monitoring the trees.

2. **O&M staff:** None

3. **Local regulatory authorities and response agencies**: None.
   Problems; suggestions: None.

4. **Other interviews**: ☑ Reports attached in Section VI.F. of the Five-Year Review.
John Scrunton, Town Administrator, Town of Barrington, NH.
Stanley Swier, Richard Maier, Philip Treadwell, Commissioners, Swains Lake Village Water District

III. ON-SITE DOCUMENTS & RECORDS VERIFIED

1. **O&M Documents**

☐ O&M manual	☑ Readily available	☑ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☑ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☑ N/A

Remarks: None.

2. **Site-Specific Health and Safety Plan** ☑ Readily available ☑ Up to date ☐ N/A
   ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☑ N/A
   Remarks: None.

3. **O&M and OSHA Training Records** ☑ Readily available ☑ Up to date ☐ N/A
   Remarks: None.

Site Inspection Checklist (Continued)

4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☑ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☑ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☑ N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	☑ N/A
	Remarks: None.			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks: None.			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks: None.			
7.	**Groundwater Monitoring Records**	☑ Readily available	☑ Up to date	☐ N/A
	Remarks: None.			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks: None.			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☑ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☑ N/A
	Remarks: None.			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks: None.			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house	☐ Contractor for State
☑ PRP in-house	☐ Contractor for PRP
☐ Federal Facility in-house	☐ Contractor for Federal Facility
☐ Other: None.	

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing ☑ N/A

Remarks: Fence was removed at the neighbor's request. No risk is associated with trespassing.

B. Other Access Restrictions

Signs and other security measures: None.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☑ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☑ No	☐ N/A

Type of monitoring: Visual inspections and water bills. Frequency: Annual, periodic.

Responsible party/agency: Swains Lake Village Water District.

Contact: Richard Maier (Name) Water Commissioner (Title) 1-603-664-9267 (Phone no.)

Reporting is up-to-date	☑ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☑ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met:	☑ Yes	☐ No	☐ N/A
Violations have been reported:	☐ Yes	☑ No	☐ N/A

Other problems or suggestions: None.

Site Inspection Checklist (Continued)

2. **Adequacy** ☐ ICs are adequate ☑ ICs are inadequate ☐ N/A
Remarks: Although the present ICs are adequate for the existing IC, pumping outside of the IC has been shown to cause migration in some circumstances. The Agencies and PRP are exploring options to expand the area prohibiting use of groundwater for drinking water purposes.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident
Remarks: None.

2. **Land use changes on site** ☑ N/A
Remarks: The Site is situated in a residential neighborhood. The residents do not want other uses.

3. **Land use changes off site** ☑ Applicable ☐ N/A
Remarks: Although the Site is surrounded by residential development, there remain many undeveloped areas outside of current institutional controls that may yet influence groundwater flow from the site. If these areas are developed and drinking water is supplied by groundwater, those wells may influence contaminant migration.

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☑ N/A

B. Other Site Conditions: None.

VII. LANDFILL COVERS ☐ Applicable ☑ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☑ N/A

IX. REMEDIAL ACTION ☑ Applicable ☐ N/A

A. Treatment System ☐ Applicable ☑ N/A
Remarks: The overburden remedy, dual vacuum extraction, was performed until that remedy met performance criteria in 1998. Hotspot treatments using that system lasted until 2008. The bedrock remedy was implemented and supplemented with in situ pilot tests to determine effective means of addressing contaminants in the bedrock.

B. Monitoring Data

1. **Monitoring Data:**
☑ Is routinely submitted on time ☑ Is of acceptable quality

2. **Monitoring data suggests**:
☑ Groundwater plume is effectively contained under ambient conditions (see Technical Assessment Summary beginning on page 27).
☑ Contaminant concentrations are declining

C. Monitored Natural Attenuation

Monitoring Wells (natural attenuation remedy)
☑ Properly secured/locked ☑ Functioning ☑ Routinely sampled ☑ Good condition
☑ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks: Technical assessment of the remedy is located in Appendix D of this Report.

X. OTHER REMEDIES None.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy: The current remedy is monitored natural attenuation and phytoremediation. Additional remedial efforts will occur during the spring and summer of 2013.

B. Adequacy of O&M: Maintaining the trees as part of the phytoremediation remedy is the only current O&M.

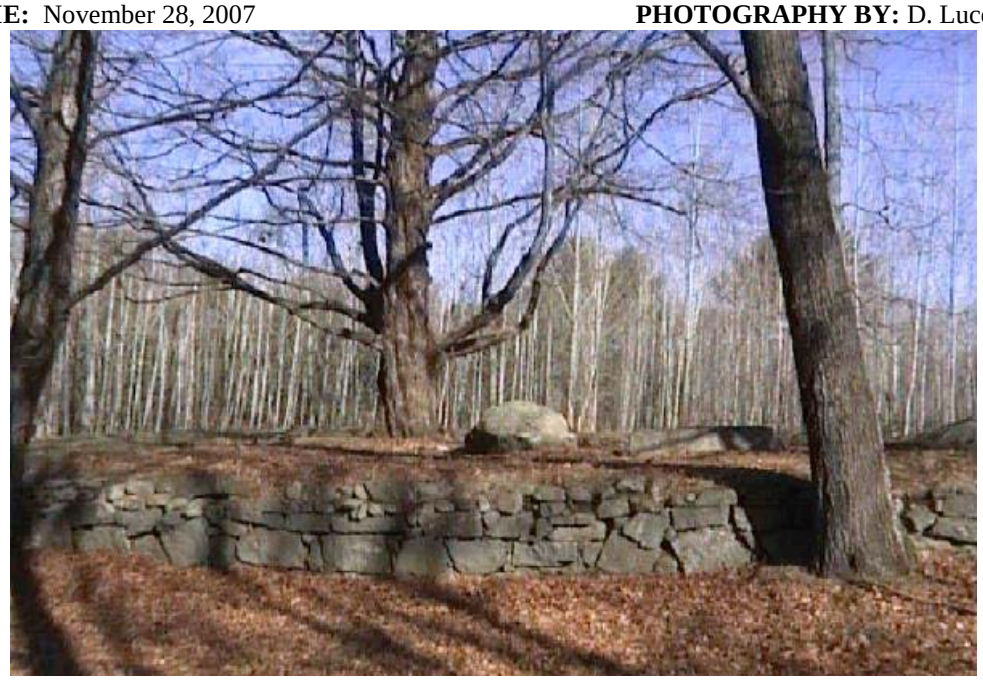
C. Early Indicators of Potential Remedy Problems: None (see Technical Assessment Summary beginning on page 27)..

D. Opportunities for Optimization: Appendix D outlines the means to address the remaining contaminants in the bedrock groundwater.

APPENDIX C: PHOTOGRAPHS DOCUMENTING SITE CONDITIONS

PHOTOGRAPHY LOG SHEET
Tibbetts Road Superfund Site ● Barrington, New Hampshire

SCENE: Tibbetts Road facing west, the site is on the right hand side behind the stone wall.
DATE/TIME: November 28, 2007 **PHOTOGRAPHY BY:** D. Luce



SCENE: Standing on Tibbetts Road looking northward into the site. The former Johnson residence stood behind the Sugar Maple before it was removed in 1995.
DATE/TIME: November 28,2007 **PHOTOGRAPHY BY:** D. Luce

PHOTOGRAPHY LOG SHEET
Tibbetts Road Superfund Site ● Barrington, New Hampshire

SCENE: Standing on the northern edge of the property line for the site and looking southward towards Tibbetts Road. The poplar trees were planted as part of the phytoremediation and are now 10 years old.
DATE/TIME: April 15, 2008 **PHOTOGRAPHY BY:** D. Luce

SCENE: Standing on the northern edge of the property line for the site and looking northward at wells 69R and 169R.
DATE/TIME: April 15, 2008 **PHOTOGRAPHY BY:** D. Luce

PHOTOGRAPHY LOG SHEET
Tibbetts Road Superfund Site ● Barrington, New Hampshire

SCENE: The Swains Lake Village Water District Treatment House Building looking northward towards Swains Lake (covered in ice).
DATE/TIME: April 15, 2008 **PHOTOGRAPHY BY:** D. Luce

No photos were taken during the February 20, 2013 Site visit. The Site and surrounding area had not changed substantially and the area was covered in snow, reducing what could be observed.

APPENDIX D: TECHNICAL ASSESSMENT

Appendix D
Technical Analysis of Contaminant Status
Tibbetts Road Superfund Site, Barrington, New Hampshire
June 2013

1. Purpose

This appendix characterizes the concentrations of Site contaminants of concern and discusses progress towards meeting Interim Cleanup Levels (ICLs). Source materials for this summary includes the evaluation of Site conditions as of 2012 prepared by ARCADIS and utilizes the figures in the attached Five-Year Review.[30,31]

The two areas of groundwater contamination are the overburden and the bedrock aquifers. Overburden groundwater contamination is restricted to the footprint of the former Johnson property and now consists of an isolated occurrence. Bedrock groundwater contamination is best characterized by a high concentration to the northeast of the former Johnson property that migrates through a complex fracture system when outside pumping forces are applied.

2. Overburden Aquifer

Cleanup at the Site focused on the overburden glacial materials that constitute the upper 20 feet of aquifer at the Site, removing more than 800 pounds of contaminants in the late 1990's. Subsequent hot spot treatment, biodegradation, and phytoremediation have reduced contamination such that only one well in the overburden aquifer, EW-10S, remained above ICLs for any volatile organic compound (VOC) in 2012. The only contaminant detected above ICLs in EW-10S was toluene (23,000 ppb), significantly above its ICL of 1,000. Yet, less than 20 feet away well 51S had a concentration of just 6.8 ppb. This indicates the narrow zone of contamination represented by EW-10S. In the late spring of 2013 soil from the area of EW-10S was removed. It is anticipated that following this removal, all ICLs for VOC contaminants in the overburden will be met; however, additional monitoring is required.

Arsenic and manganese are pervasive overburden groundwater contaminants, but their concentrations over time have declined as predicted for increasing concentrations of dissolved oxygen (DO) in the overburden groundwater. The highest concentration of arsenic (177 ppb) corresponded with a high concentration of manganese (too high to verify) and a low DO content (0.6 mg/l). Generally, under 1 mg/l is considered anaerobic. A prediction of when these metals will attain ICLs in overburden groundwater is not practical; however, concentrations should continue to decline as the DO concentrations rise. In the 2008 Five-Year Review the maximum concentration for arsenic and manganese in overburden groundwater was 280 and 8,710 ppb, respectively. In 2012 the maximum concentrations are 177 and 7,660 ppb, respectively. Table D1 displays the concentration trends for contaminants:

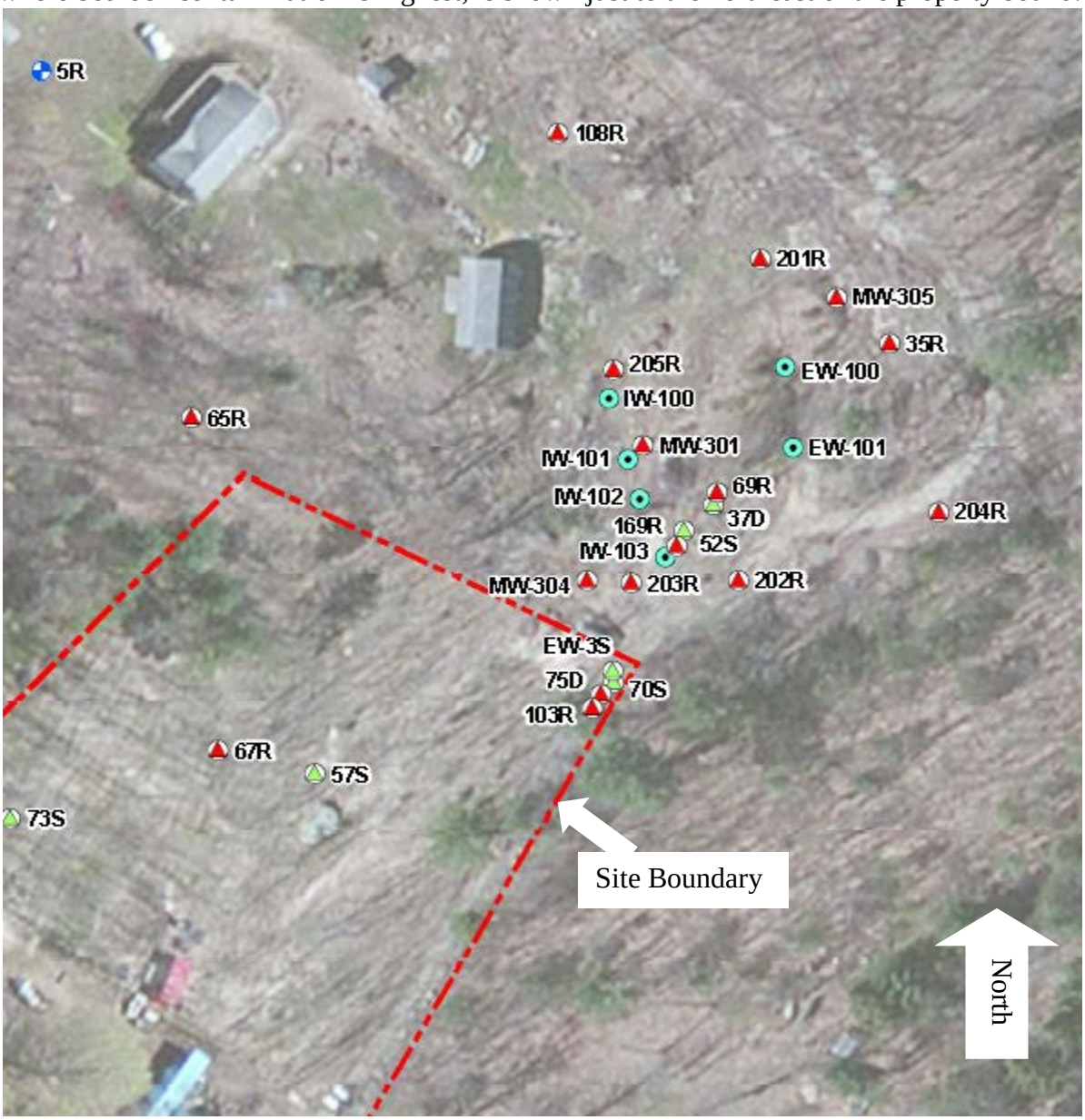
[30] *Evaluation of Current Biogeochemical Conditions and Applicability of Monitored Natural Attenuation*, Tibbetts Road Site…December 2007 (ARCADIS: Lowell, MA).
[31] *Summary of Environmental Monitoring, Tibbetts Road Site, Barrington, NH*, ARCADIS, May 2013.

Table D1: Tibbetts Road Superfund Site Contamination Trends in Overburden Groundwater									
	1996, Prior to Remediation (41 total wells)			2008, Last 5 Year Review (28 total wells)			2012 (7 total wells)		
Contaminant	**Concentration (µg/l)**		**Detection**	**Concentration (µg/l)**		**Detection**	**Concentration (µg/l)**		**Detection**
[Cleanup Level (µg/l)]	**Maximum**	**Mean**	**Frequency**	**Maximum**	**Mean**	**Frequency**	**Maximum**	**Mean**	**Frequency**
Volatile Organic Compounds									
Trichloroethene [5]	27,000	1,928	21	8,700	710	12	Below Standard		
Tetrachloroethene [5]	3,200	205	14	360	40	8	Below Standard		
cis-1,2 dichloroethene [70]	18,000	2,922	10	7,500	638	13	Below Standard		
4-methyl-2-pentanone [1,825]	96,000	31,054	6	23,000	8,967	3	Below Standard		
Benzene [5]	4,100	924	15	1,300	168	10	Below Standard		
Ethylbenzene [700]	4,700	1,908	11	2,400	1,055	5	Below Standard		
Toluene [1,000]	140,000	16,705	17	37,000	6,452	8	22,600	-	1
Inorganic Contaminants									
Arsenic [10]	446	99	28	280	---	18	177	70	5
Manganese [3,650]	44,500	11,300	12	8,710	---	14	7,660	6,112	3

3. Bedrock Aquifer

Reportedly, VOCs and gasoline components such as benzene, were released onto the ground surface prior to and during the early1980's. Once on the surface they infiltrated into overburden groundwater. The primary flow of contaminants in the overburden groundwater was to the north. Groundwater flow entered the bedrock just north of the Site boundary in the vicinity of wells 75D to MW-301 as shown below in Figure D1.

Figure D1. The Site is within the red bounds. The relevant portion of the monitoring network, where bedrock contamination is highest, is shown just to the northeast of the property bound.[32]



[32] ARCADIS, May 2013, p. 29, Figure 2.

Bedrock groundwater remediation began in 2001 with small-scale pumping from well 169R, which is right of center in Figure D1. After assessing recovery, a series of *in situ* ISCO treatments of the bedrock groundwater occurred that are detailed in the 2008 Five Year Review. The belief was that the highest bedrock groundwater contamination was present in the area of 169R. Further work in this area demonstrated that the bedrock in the area shown in Figure D1 has fracturing that is relatively isolated from the regional trends and extends down to 125 feet below ground surface. These fractures are more likely the result of glaciation rather than the earlier stress field that produced the regional northeast-southwest trending fractures.[33] The consequence of this geometry is a rather slow migration of contaminants under ambient conditions. However, pumping of groundwater in some areas will exacerbate migration. Therefore, further work will be performed under an approved work plan to delineate the best means to distribute a compound in the isolated fracture system and minimize the effects to the regional fracture system. This effort will also examine the stresses that other pumping of groundwater in the area place on the contaminants.

The remedial efforts have resulted in the reduction of all contaminants in bedrock groundwater. Table D2, below, shows the trend of contamination in bedrock groundwater.

[33] ARCADIS, May 2013, pages 20 – 23 of Appendix A.

Table D2: Tibbetts Road Superfund Site Contamination Trends in Bedrock Groundwater									
	1996, Prior to Remediation (18 total wells)			2008, Last 5 Year Review (22 total wells)			2012 (37 total wells)		
Contaminant [Cleanup Level (µg/l)]	**Concentration (µg/l) Maximum**	**Mean**	**Detection Frequency**	**Concentration (µg/l) Maximum**	**Mean**	**Detection Frequency**	**Concentration (µg/l) Maximum**	**Mean**	**Detection Frequency**
Volatile Organic Compounds									
Trichloroethene [5]	3,000	345	7	64	20	9	39	18	10
Tetrachloroethene [5]	11	11	1	6	6	1	Below Standard		
cis-1,2 dichloroethene [70]	1,300	898	2	1,800	477	14	432	156	6
4-methyl-2-pentanone [1,825]	51,000	22,900	2	76,000	16,405	5	1,960	1,975	1
Benzene [5]	4,800	799	6	6,300	986	17	459	125	14
Ethylbenzene [700]	Below Standard			1,200	907	4	Below Standard		
Toluene [1,000]	9,000	5,250	1	20,000	8,460	6	Below Standard		
Inorganic Contaminants									
Arsenic [10]	960	84	12	160	43	17	95	36	14
Manganese [3,650]	11,400	5,828	1	490,000	36,913	8	14,900	10,813	2

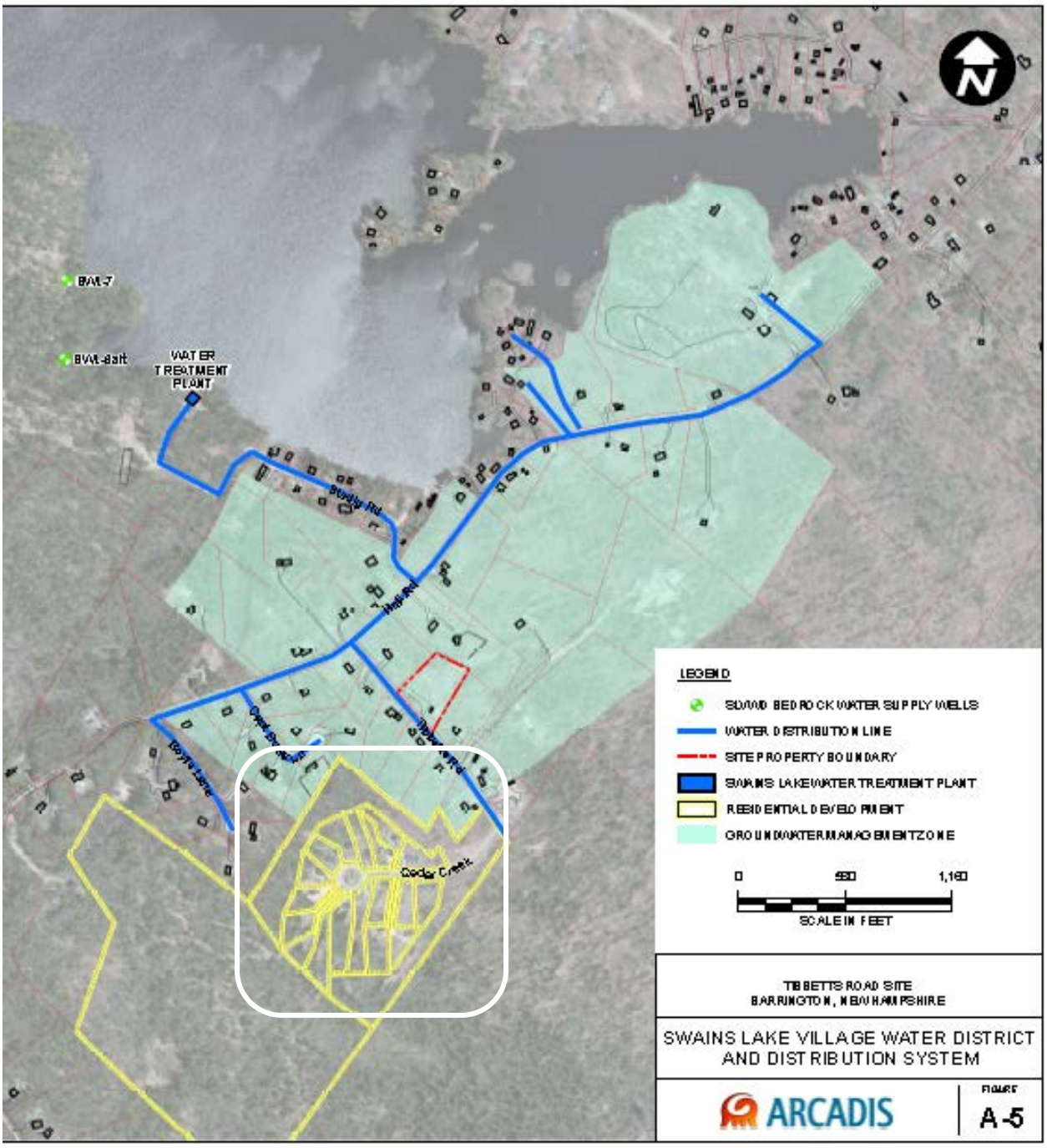
Table D2 demonstrates that most of the contaminants have decreased by more than 90% over their pre-remediation concentrations. Six contaminants in bedrock groundwater remain significantly above their ICLs. The manganese concentration increased dramatically by 2008 due to the injection of sodium permanganate in an effort to reduce chlorinated and other organic contaminants. The manganese will decline in concentration as the groundwater becomes more aerobic. Although these trends are encouraging, there are three points to consider in determining whether additional remedial actions are necessary: the potential for migration of groundwater contaminants to groundwater users outside of the area of institutional controls, 2) the value of the bedrock groundwater resource, and 3) the remedies that are likely to meet ICLs.

1) The Potential for Contaminant Flow to Wells Outside of the Institutional Controls

In the vicinity of the Site, the bedrock groundwater generally used for drinking water is present in fractures that trend generally northeast-southwest and vary in their connectivity and yield. The fracture flow can be significant and can communicate over large distances. The contamination of residential drinking water wells was the primary risk generated at the Site.

Two examples highlight the ability of contaminants to communicate with other wells in the fracture system. The first is a campground that lies 3,000 feet north of the Site, along the line of the fracture trend that extends from the Site. The well serving the campground pumped nearly 1 million gallons over a five month period every year before 1993. By 1992, monitoring showed low levels of TCE in the campground well. EPA extended the water service to the campground in 1993. The second example is the Cedar Creek subdivision which began construction in 2008. This residential subdivision was built just outside the IC. Bedrock monitoring wells showed no Site contaminants in this area. After bedrock wells began operating in the subdivision, bedrock groundwater contamination with TCE was detected at low levels. Although residential wells do not place much stress on an aquifer, in the case of Cedar Creek a large number of wells were grouped close together increasing the effective rate of withdrawal. Figure D2 shows the Site, the drinking water distribution system, the Cedar Creek subdivision, and the IC.

Figure D2. The Tibbetts Road Superfund Site and surrounding features and the Cedar Creek subdivision encircled in white.[34]



The plume of VOC contaminants, principally benzene and TCE, extends in a finger-like fashion in bedrock groundwater from the Site to the northern-most wells in the Cedar Creek subdivision.[35]

[34] ARCADIS, May 2013, Figure A5, page 88.

Figure D3. The extent of Benzene bedrock groundwater contamination emanating from the Tibbetts Road Site. The red area has concentrations that exceed 50 µg/l and the purple area encompasses areas that exceed the ICL, 5 µg/l.

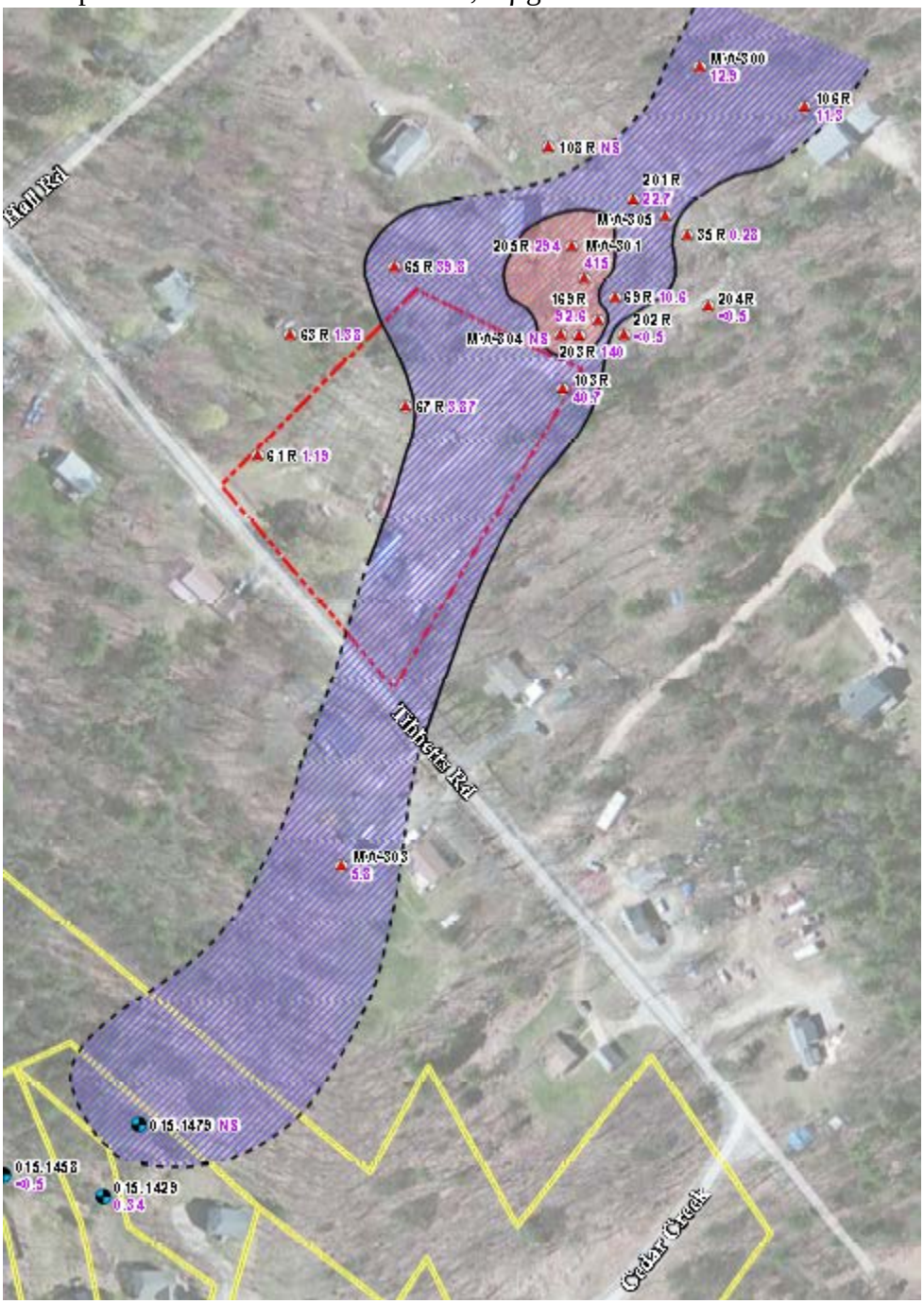


Figure D3 overlays the extent of contamination, which is also the approximate distribution of other contaminants, onto the aerial photo of the Site and surrounding area. The lower left (southwest) corner of Figure D3 has the lot lines for the Cedar Creek subdivision shown on

[35] ARCADIS, May 2013, Figures 4 and 6 on pages 31 and 33.

Figure D2. On Figure D2 the Cedar Creek subdivision is shown as a group of small lots clustered in an open space development. A buffer of land outlined in yellow on Figure D2 that surrounds the cluster and a larger, separate area that lies south west of the cluster are permanently protected open space that resulted from permitting of the subdivision. One of the factors that influenced the migration of contaminants from the Site is the close proximity of the wells to one another in the subdivision. Each house has its own bedrock well. Presently, there are 16 wells operating in this small area. There are four homes that have contaminants above the ICLs. Those concentrations are shown, anonymously, for samples collected in April 2013, in the data summary below.

Site Contaminant	Well A	Well B	Well C	Well D	ICL
Benzene	**6.95**	0.936	**7.69**	**19.9**	**5**
cis-1,2-Dichloroethene	**70.5**	58.3	58.6	**94.7**	**70**
Trichloroethene	**6.27**	**5.74**	4.25	**7.6**	**5**
Vinyl chloride	0.274 J	< 0.5	0.306 J	0.607	**2**
	Indicates value is greater than the ICL				

These homes, plus one additional home that has concentrations of Site contaminants, but is below the ICL, have point-of-use carbon filtration units. The influent and effluent on these treatment systems are sampled on a quarterly basis. The effluent has been below detection limits in all instances. The other homes are sampled on an annual basis. The common thread for these four wells is that they all lie less than 800 feet south of the Site and are in bedrock wells that have open intervals below 300 feet and yield significant amounts of water, on average 52 ± 20 gallons per minute (1sd, n=4). The remaining wells in the subdivision vary in finished depth and yield 21 ± 21 gallons per minute (1sd, n=11). Sixteen wells, each pumping approximately 100 gallons or more per day, in an approximately 10-acre area may create an opportunity for bedrock groundwater contamination migration.

Although there are several bedrock drinking water wells just outside the border of the IC, they have all existed since before the IC and are in an area of lower density with respect to groundwater pumping. Although extending the current drinking water system to the residents on Cedar Creek is now feasible, both the SLVWD and the PRP have concerns about similar occurrences in the future. There is a considerable amount of vacant land in the vicinity of the Site that is uncontaminated and outside the IC, yet close enough to warrant a concern about migration should a similar residential use occur. Therefore, EPA, the PRP and SLVWD will work to expand the IC to these undeveloped areas to provide a 1000-foot buffer zone that limits future development until ICLs are attained.

2) The Value of the Bedrock Groundwater Resource

Bedrock groundwater is a critical resource in Southern New Hampshire and is the only source of drinking water in the Town of Barrington. The SLVWD commissioned a study that verified that the bedrock source for the SLVWD would not be affected by the Site contamination. A monitoring well (SWL-MW1) monitored by the SLVWD was installed to provide such a warning.[36] ARCADIS will be conducting additional monitoring and analysis to ensure the

[36] *Draft Final Report For New Small Production Wells For Small Community Water Systems, Swains Lake Village Water District, Barrington, New Hampshire*. Emery & Garrett Groundwater, Inc., Meredith, NH. June 2011.

drinking water supply wells are protected. The location of the Site, the SLVWD drinking water distribution system and the limit of institutional controls are shown on Figure D2.

3) Remedies Likely to Attain ICLs

An *ex situ* remedy, groundwater extraction from well 169R, and an *in situ* remedy, oxidation through sodium permanganate addition have been shown to be ineffective in extracting or treating contaminants in the bedrock. In 2012 EPA approved a work plan submitted by ARCADIS to conduct a pilot test of *in situ* oxidation using persulfate solution and directed groundwater injection. In 2013 EPA approved a transducer study to further this effort. During the summer of 2013 implementation of these studies will help increase understanding of the fracture system and how best to address contamination.

Persulfate was selected as it can treat all of the contaminants above ICLs in the bedrock aquifer and can be activated by the ambient concentrations of iron that are in the aquifer. The transducer study and monitoring of the directed groundwater recirculation system will provide data to determine the effectiveness of the persulfate in addressing contamination and in its distribution in the aquifer. Once the data is evaluated, and if appropriate, the system will be fully designed. If unsuccessful, additional *in situ* and *ex situ* remedies will be explored to restore the bedrock aquifer.

Conclusion

The remaining relevant contamination is in the bedrock aquifer. Bedrock groundwater contamination must be prevented from migrating in what is a well-connected fracture system until it can be restored to natural conditions. To prevent migration it will be necessary to prohibit any groundwater withdrawals in the area that may influence migration. This requires the expansion of institutional controls. Ultimately, the better means to prevent migration will be an aggressive effort to reduce concentrations in the source area. This is being tested through pilot treatments designed to oxidize the contaminants *in situ*. Additional monitoring and modeling of the bedrock aquifer will be necessary to estimate the effectiveness of the pilot effort and determine the better way to achieve all ICLs. Bedrock groundwater monitoring will also be necessary to determine if withdrawals outside the IC affect plume migration.

Eliminating or reducing VOC concentrations would restore the bedrock aquifer to natural conditions and create an aerobic environment that would allow inorganic contaminants such as arsenic and other metals to return to background concentrations. Until those conditions are met, the SLVWD must operate the drinking water treatment system and institutional controls must be maintained.

APPENDIX E: INSTITUTIONAL CONTROLS

Appendix E
Analysis of Institutional Controls
Tibbetts Road Superfund Site, Barrington, New Hampshire
July 2013

It is necessary to expand the current limit of Institutional Controls (ICs) in the vicinity of the Tibbetts Road Superfund Site to prevent contaminant migration in bedrock groundwater. The limit of the current ICs were established by the 1995 Consent Decree (1995 CD) in Part X, Section 33. The Swains Lake Village Water District (SLVWD) enacted an Ordinance prohibiting the extraction of groundwater within the area of ICs at its annual meeting in April 1995 (Attachment A). The proposed expansion will prohibit the pumping of groundwater for any purpose in an area of approximately 1000 feet from the area of bedrock groundwater contamination on Tibbetts Road (generally the 1.9 acre Site) unless contrary evidence, acceptable to EPA, is provided.

The migration of contaminants from the Site due to pumping from domestic wells in the new, Cedar Creek subdivision has caused EPA to examine the need to extend ICs as provided in Part X, Section 33, paragraph a of the 1995 CD. Based on this instance and the highly transmissive nature of bedrock fractures in the area of the Site, EPA believes that pumping in additional areas may induce further migration and contaminate additional drinking water wells outside the current limit of ICs. Therefore, ICs that prevent the use of groundwater must be expanded to include the following properties listed on the Barrington Tax Maps:

Map 262: Lots 52, 37, 14.1A, 14.2A, 14, 36, 35, 34, 33, 32, 31, 30, 14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7, 14.8, 14.9, 14.10, 14.11, 14.12, 14.13, 14.14, 14.15, 14.16, 14.17, 14.18, 11, 10, 9, 8, and 7.
Map 263: Lot 13. Map 121: Lots 6, 7, 5, 4, 3, 2, 1. Map 122: Lots 23, 24, and 25.
Map 254: Lots 29, 30 and 31.

The SLVWD communicated the process to extend the ICs through the current instrument and the limitations through their counsel in a March 28, 2013 letter that is contained in Attachment B. Subsequent communications from SLVWD's Counsel, Attachment C, asked for the expansion of ICs to prevent contaminant migration in bedrock groundwater.

Expanding the ICs will require that the SLVWD to expand the ordinance to provide drinking water to the homes on Cedar Creek to prevent ingestion and contaminant migration. The additional, vacant properties listed above will require that further limitations be put into place that either prohibit groundwater use or require an alternative water supply other than bedrock groundwater. Several of the listed properties have existing structures that use groundwater for domestic purposes. Presently, their rates of withdrawal have not induced migration of contaminated bedrock groundwater. Hydrogeological investigations to be conducted by ARCADIS will help verify whether or not these groundwater withdrawals affect the Site contaminant migration and if alternative water sources should be provided.

Attachment A – Swains Lake Village Water District Ordinance

ORDINANCE

1. Authority. This Ordinance is adopted under RSA 52:3.

2. Purposes. This Ordinance is intended to protect public health, safety and welfare and the environment by:

A. Preventing consumption of contaminated and potentially groundwater associated with the Tibbetts Road Superfund Site ("Site") until the completion of all Work addressing the contamination under the Consent Decree;

B. Providing full and unrestricted access to private and public property as necessary to implement the requirements of the Consent Decree and the Agreement; and

C. Preventing interference with the Work at the Site, by restricting use and other activities affecting groundwater in the vicinity of the Site, until the Work is completed.

3. Definitions.

A. "Agreement" shall mean the Final Settlement Agreement and Order agreed to by Ford and the District in Boucher, et al. v. Ford Motor Company, Civ. Act. No. C-91-709-D (D.N.H.).

B. "Area" shall mean and include the area within the District shown on Tax Maps 10 and 11 (dated April 1990 on file at the Barrington Tax Assessors Office, Barrington, New Hampshire), marked to show properties (which shall include subsequent subdivisions of such properties) subject to institutional controls which is Attachment B to the Consent Decree (on file in the office of the District Commissioners at _____, along with a list of the subject properties, and available for public

inspection during regular business hours), as well as any additional areas or properties within the District which thereafter may be designated as needing institutional controls by U.S. EPA, after a reasonable opportunity for review and comment by the DES.

C. "Consent Decree" shall mean the Consent Decree agreed to by the United States, the State, District and Ford Motor Company in United States and State of New Hampshire v. Ford Motor Company, Civ. Act. Nos. C-91-120-S and C-91-194-S (D.N.H.).

D. "DES" shall mean the New Hampshire Department of Environmental Services and any successor departments or agencies.

E. "District" shall mean the Swains Lake Village Water District, incorporated pursuant to RSA Ch. 52, and any successor entities, departments or agencies.

F. "Ford" shall mean Ford Motor Company, a corporation presently incorporated in the State of Delaware and with its headquarters in Dearborn, Michigan.

G. "Groundwater" shall mean water in a saturated zone or stratum beneath the surface of land or water.

H. "Person" shall mean an individual, firm, corporation, association, partnership, consortium, joint venture, commercial entity, the United States, State, Ford, the District, municipality, commission, political subdivision of a State, or any interstate body.

I. "Public Water Supply" shall mean the water supply system owned and operated by the District, its successors, or assigns.

J. "Restricted Groundwater" shall mean groundwater in the overburden, weathered bedrock, and competent bedrock aquifers underlying the Area.

K. "Site" shall mean the Tibbetts Road Superfund Site in Barrington, New Hampshire.

L. "State" shall mean the government of the State of New Hampshire and all agencies or departments thereof.

M. "United States" shall mean the federal government and all agencies or departments thereof.

N. "U.S. EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies.

O. "Work" shall mean all activities Ford or the District are required to perform under the Consent Decree, except for the retention of records.

4. Groundwater Restrictions.

A. Use Restrictions.

(1) No person shall use Restricted Groundwater for any purpose within the Area, except as provided in Section 4.A(2) of this Ordinance.

(2) No person shall use Restricted Groundwater within the Area for more than 30 days after the effective date of this Ordinance at an existing dwelling, building or other structure not connected to the Public Water Supply on the effective date of this Ordinance.

B. Well, Excavation, and Construction Restrictions.

Except as necessary to perform work under the Decree:

(1) No person shall dig, drill, or otherwise create any new well or modify in any way an existing well in the Restricted Groundwater.

(2) No person shall use any existing Restricted Groundwater well in the Area for any purpose, except as temporarily permitted by Section 4.A(2) of this Ordinance.

(3) No person shall take any action within the Area that may interfere with the integrity of any groundwater monitoring wells in the Restricted Groundwater, any cover placed on the Site over the Restricted Groundwater, or any other equipment installed within the Area to implement the cleanup of Restricted Groundwater as required by the Work under the Consent Decree.

(4) No person shall install any structure of any kind in the Area at or below the level of Restricted Groundwater in such a way that would constitute a material hydrologic alteration of the flow of Restricted Groundwater or otherwise materially impact the effectiveness of the Work.

5. Access.

A. Any person that owns or occupies any real property within the boundaries of the District shall provide full and unrestricted access at all reasonable times to such property to Ford, the United States, the State, and the District and to each entity's representatives (including U.S. EPA and DES) for the purpose of installing groundwater monitoring wells, collecting samples from groundwater monitoring wells or other groundwater wells, collecting soil samples, or collecting surface water

3%

samples as necessary to implement the Work under the Consent Decree. When feasible, the entity desiring access shall make a reasonable attempt to provide at least 24 hours notice to either the property owner or occupant before arriving at the property.

B. Any person that owns or occupies any real property located within the boundaries of the District shall provide full and unrestricted access at all reasonable times to such property to Ford, the United States, the State, and the District and to each entity's representatives (including U.S. EPA and DES), contractors, agents, successors and assigns, for the purpose of conducting any other activity related to implementation of the Work as provided in the Consent Decree. When feasible, the entity desiring access shall make a reasonable attempt to provide at least 24 hours notice to the property owner or occupant before arriving at the property.

C. The District shall provide full and unrestricted access at all reasonable times to any property controlled by the District to Ford, the United States, and the State, and to each entity's representatives (including U.S. EPA and DES), contractors, agents, successors and assigns, for the purpose of conducting any activity related to implementation of the Work as provided in the Consent Decree.

6. Penalties and Enforcement.

A. Any person who violates this Ordinance shall be subject to a civil penalty not to exceed One Hundred ($100.00) Dollars for each offense. Each day of violation shall constitute

a separate offense. The penalty shall be payable to the District.

B. Any person who violates the Ordinance shall be subject to the power of the United States District Court, District of New Hampshire, or a local State court of general jurisdiction, to enjoin future violations of the Ordinance and to require compliance with this Ordinance.

C. The District or Ford may enforce this Ordinance by commencing a civil action in the United States District Court, District of New Hampshire, or in the local State court of general jurisdiction, seeking a civil penalty or an injunction or both, provided that nothing herein shall be deemed to limit the authority of the District, Ford, or any other person to take any other appropriate equitable or civil remedy.

7. Severability. The invalidity of any part or parts of this Ordinance shall not affect the validity of the remaining parts.

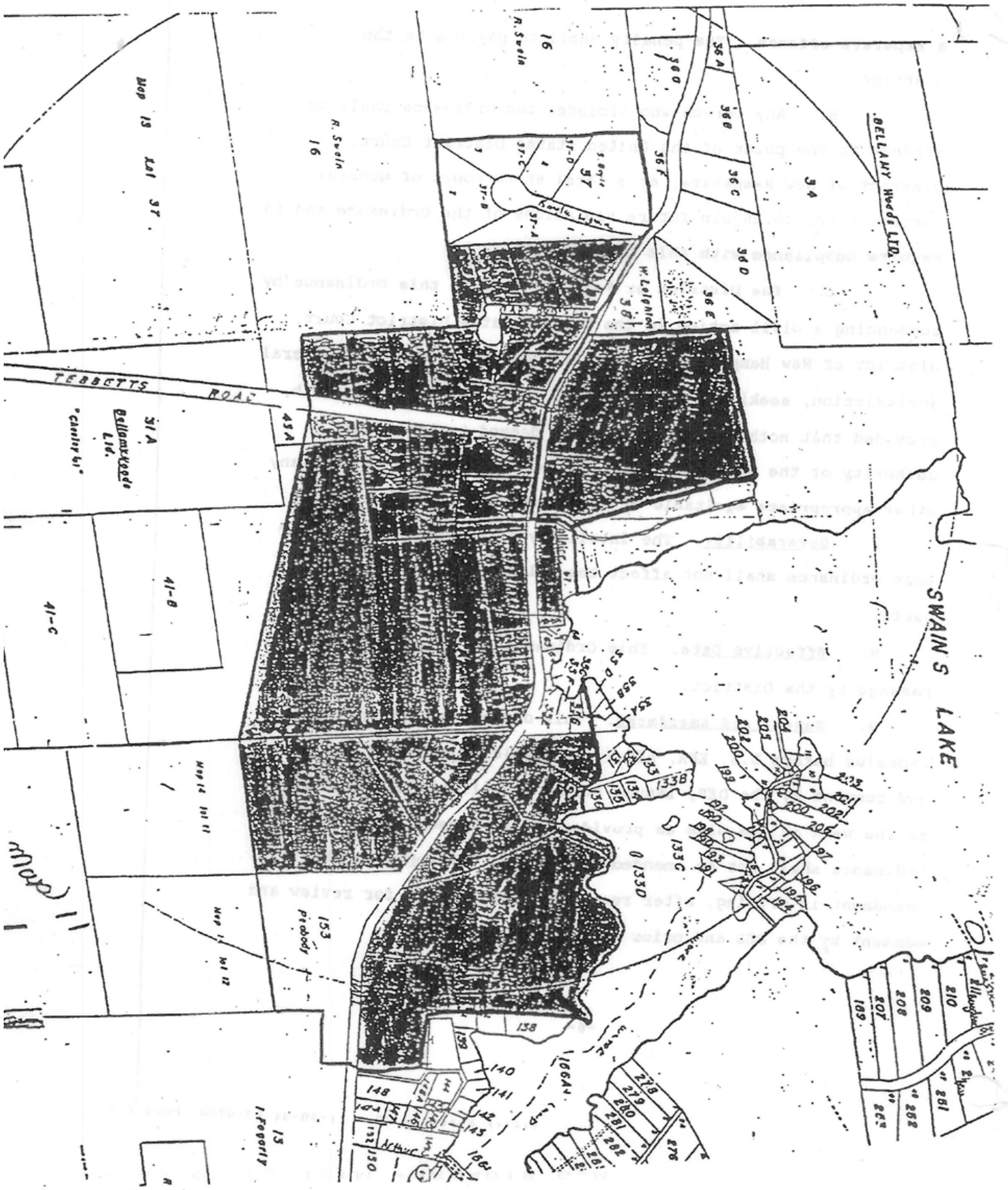
8. Effective Date. This Ordinance shall take effect upon passage by the District.

9. Repeal and Amendment. This Ordinance shall not be repealed before U.S. EPA, after reasonable opportunity for review and comment by the DES, issues Ford a Certificate of Completion of the Work at the Site as provided in the Consent Decree. This Ordinance shall not be amended unless U.S. EPA approves the amendment in writing, after reasonable opportunity for review and comment by the DES and prior written notice to Ford.

3%

PROPERTIES THAT REQUIRE INSTITUTIONAL CONTROLS

(such properties appear in shaded area)



Attachment B - Letter from Stephen Buckley, Counsel to SLVWD to Charles Pinter, Ford Motor Company, March 28, 2013

HAGE HODES PA
ATTORNEYS AT LAW

STEPHEN C. BUCKLEY, ESQUIRE
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FACSIMILE: (603) 641-6333

March 28, 2013

VIA EMAIL ONLY
Charles Pinter, Sr. Environmental Engineer
Ford Motor Company
Environmental Quality Office
Fair Lane Plaza North
290 Town Center Drive, Suite 800
Dearborn, MI 48126

RE: Swain's Lake Village District – Proposed Cedar Creek Subdivision Addition

Dear Mr. Pinter:

This office represents the interests of the Swain's Lake Village Water District and I write this letter to address some concerns the District Commissioners have with the proposed addition of the Cedar Creek Subdivision to the service area of the Swain's Lake Village Water District.

In order to expand the boundaries of the Swain's Lake Village Water District, it is necessary to file a Petition with the Selectmen of the Town of Barrington, NH, as provided in NH RSA 52:5 (I). Upon filing a Petition to expand the boundaries of the District the Barrington Selectmen would hold a public hearing after providing notice to all existing and proposed district residents. Once that hearing is held and the Selectmen approve the district boundary change then the District would have to ratify the boundary change at a District Meeting. At that meeting all existing and proposed District residents would vote on whether to ratify the Selectmen's decision to include the Cedar Creek Subdivision in the District. Ratification would be by majority vote of all existing and proposed Swain's Lake Village Water District members.

Ordinarily, the Swain's Lake Village Water District holds its annual meeting on the second Tuesday in April, which this year would be April 16, 2013. That being the case, there insufficient time to address the boundary expansion at this year's annual meeting. However once we have an agreement to proceed we will do so as quickly as possible. The District will have to hold a special meeting, which the District Commissioners will commit to do.

Assuming the District votes to expand its District boundaries after approval by the Barrington Selectmen, it would be then the understanding of the District Commissioners that the existing District Ordinance would be imposed as an obligation on all of the residents of the Cedar Creek Subdivision owners. This ordinance would require that all of the domestic water supplies for the homes in Cedar Creek would be required to connect to the Swain's Lake Village Water District.

If the Cedar Creek Subdivision was deemed to be in the area subject to institutional controls, then according to paragraph 4 of the Swains Lake Village Water District Ordinance, use of groundwater would be prohibited and all the homes in the subdivision would be required to connect to the District water distribution system. Our thoughts are that if EPA determined that Cedar Creek is contaminated and requires institutional controls then the whole process would go a lot smoother. This also has implications regarding a District Fee for all new hook ups of $1,000. A precedent was established when the District was expanded to connect the Campground and Ms. Gail Chase's home. While the extension was funded by superfund monies those two parties paid the District $1,000 for the hook-up fee. Our thoughts are that if the Primary Zone is extended by EPA and Ford funds the connections then someone, either the home owner or Ford would owe the District that fee. Another option here would to refund Ms. Chase's $1,000, to avoid any issues, because all other Primary Zone/contaminated wells were connected by superfund monies, except her property.

It is the understanding and expectation of the Swain's Lake Village Water District that the total cost for the construction of the expansion to include the Cedar Creek Subdivision would be paid by Ford Motor Company. Swain's Lake Village District would not consider the cost of the extension to Cedar Creek an operation and maintenance expense that is to be shared between the District 25%, and Ford 75%. Rather, the total cost for that expansion should be borne by Ford. Further, we also believe that certain water system improvements which have been suggested in the memorandum from Justin Mahon of ARCADIS dated November 13, 2012, concerning the installation of variable frequency drives, would also be paid for 100% by Ford. Finally, there will be additional transaction costs that Ford ought to reimburse the District 100%, including the cost of hiring an engineering consultant on behalf of the District, and payment of the related District attorneys fees and expenses.

I am enclosing a map that describes the current Swains Lake Village Water District boundaries, shown in yellow, and also showing the areas currently subject to institutional controls.

These are the matters that we wish for you to take into consideration as we move forward on this proposal to expand the system and we would wish to hear from you further on this matter at your earliest opportunity. I will remind the District Commissioners to contact you and arrange a telephone conference for April 9th, and that conference was to include a representative of ARCADIS.

Very truly yours,
HAGE HODES, P.A.

By: Stephen C. Buckley, Esquire

Attachment C - Letter from Stephen Buckley, Counsel to SLVWD to Darryl Luce, EPA, August 1, 2013

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ATTORNEYS AT LAW

STEPHEN C. BUCKLEY, ESQUIRE
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August 1, 2013

VIA EMAIL AND US MAIL
Darryl Luce, RPM
US Environmental Protection Agency
New England Region 1
5 Post Office Square, Suite 100
Mail Code OSRR07-1
Boston, MA 02109-3912

RE: Swain's Lake Village Water District

Dear Mr. Luce:

It is the understanding of the Swain's Lake Village Water District (SLVWD) that the EPA is in the process of preparing the Third Five Year Review Report for the Tibbetts Road Superfund site in Barrington, NH. As you embark on the preparation of that report the SLVWD Commissioners wish to express their opinion that it is imperative that the SLVWD District Boundaries, including the properties that require institutional controls, be expanded to avoid further contamination of groundwater due to well water pumping on individual parcels in areas near the Tibbetts Road site.

As you are aware, an evaluation of private wells in the newly constructed Cedar Creek Subdivision was conducted in 2012 and detected low level VOC impacts in a number of wells. In home point of entry water treatment systems were installed in those homes that exhibited VOC levels either close to or in excess of groundwater quality standards. Discussions have been undertaken with Ford Motor Company to provide a longer term solution to this issue in the Cedar Creek Subdivision by expanding the SLVWD water system to provide a substitute water supply.

The SLVWD Commissioners have also become aware that a parcel that is near to the parcel that houses the new water supply wells for SLVWD (Tax Map 122, Lot 12) has recently been put on the market. The development of that parcel, Tax Map 262, Lot 52, along with the potential development of other parcels in the area with an onsite wells alarms SLVWD. The Commissioners sincerely believe that further ground water pumping in the area adjacent to Swains Lake will likely lead to the very situation faced by the homeowners in the Cedar Creek Subdivision, and also may put in jeopardy the new supply wells for SLVWD. For these and other reasons we urge EPA to employ the authority delegated to EPA pursuant to Section 3 (B) of the SLVWD District Ordinance to expand the areas in the District where properties are subject to institutional control and must connect to the SLVWD system. Such expansion should include not only the Cedar Creek Subdivision but also all other properties, such as Tax Map 122 Lots 23, 24 ,25, and Tax Map 262, Lot 52, where pumping ground water for domestic water consumption would likely cause contaminants to migrate further from the Tibbetts Road site.

It would be the expectation of the SLVWD that the total cost for the construction of any expansion of the District to include more properties under institutional control would be paid by Ford Motor Company. SLVWD would not consider the cost of District expansion and related water line extension to be an operation and maintenance expense that is to be shared between the District 25%, and Ford 75%. Rather, the total cost for that expansion should be borne by Ford. Further, SLVWD would expect that the District's Engineers would be directly involved in the design and implementation of any water line extension.

Implementing a new SLVWD District Ordinance that requires a larger number of homes to connect to the SLVWD water system will likely raise concerns over the impact on private property rights. The Commissioners are not unmindful of the constitutional limits on the police power where private property rights are involved. The public benefit and the harm to be avoided must be weighed against those rights to determine the reasonableness of any action by the Federal Government. Kennedy v. Town of Sunapee, 147 NH 79, 82 (2001). In this instance the SLVWD Commissioners believe a reasonable expansion of the District to include more properties subject to institutional controls, where that expansion is supported by adequate scientific evidence that the expansion will avoid further harm to the environment and to human health, will pass constitutional muster.

The SLVWD Commissioners request you to take into consideration this suggested District expansion as you prepare the Third Five Year Report. Thank you.

Very truly yours,
HAGE-HODES, P.A.

By: Stephen C. Buckley, Esquire

cc: SLVWD Commissioners (via email)
Eve S. Vaudo, Esquire, EPA (via email and US Mail)
Charles Pinter, Ford Motor Company (via email and US Mail)
Kenneth Richards, NHDES (via email and US Mail)
Cynthia Klevens, NHDES (via US Mail)